EXHIBIT 39

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF VERMONT

- -

JAMES D. SULLIVAN et al., individually and on behalf of a class of persons similarly situated,

Plaintiffs,

v.

Civil Action No. 5:16-cv-00125

SAINT-GOBAIN PERFORMANCE PLASTICS CORPORATION,

Defendant.

- -

Video-Recorded Deposition Upon Oral Examination of:
Philip K. Hopke, PhD

Location: First Federal Plaza
28 East Main Street
Rochester, New York 14614

Date: October 16, 2018

Time: 9:00 a.m.

Reported By: KIMBERLY A. BONSIGNORE

A P P E A R A N C E S

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P R O C E E D I N G S

TUESDAY, OCTOBER 16, 2018;

(Proceedings in the above-titled matter commencing at 9:01 a.m.)

* * *

THE VIDEOGRAPHER: Good morning. We are on the record at 9:01 a.m. Today is Thursday, October 16, 2018.

This is the -- today is Tuesday -- excuse me -- October 16, 2018. This is the videotaped deposition of Philip Hopke, PhD.

My name is Peter Colucci, here with our court reporter, Kim Bonsignore. We are here from Veritext National Deposition Services.

This deposition is being held at First Federal Plaza in Rochester, New York.

The caption of this case is "James D. Sullivan et al. versus Saint-Gobain Performance Plastics Corporation," Case Number 5:16-cv-00125 GWC.

At this time, will counsel please identify themselves for the record.

MS. JOSELSON: I'm Emily Joselson from Langrock, Sperry & Wool, for the plaintiffs.

MR. FLEMING: I'm Doug Fleming for the defendant, Saint-Gobain Performance Plastics.

PHILIP K. HOPKE, PhD - BY MR. FLEMING

THE VIDEOGRAPHER: Will the court reporter please swear in the witness.

PHILIP K. HOPKE, PhD,

called herein as a witness, first being sworn, testified as follows:

EXAMINATION BY MR. FLEMING:

Q. Good morning, Dr. Hopke.

A. Good morning.

Q. So you remember, I'm Doug Fleming --

A. Yes.

Q. -- and I represent defendant, Saint-Gobain.

A. Yep.

Q. I took your deposition last time in April.

A. Right.

Q. Have we spoken since then?

A. No.

Q. So we went over the rules at the last deposition, but just let's briefly discuss them again.

You understand you're under oath?

A. Yes.

Q. If you don't understand any questions today, would you make sure you let me know that.

A. Yes.

PHILIP K. HOPKE, PhD - BY MR. FLEMING

Q. If you don't, we'll assume that you understood the question.

Is that fair?

A. That's fair.

Q. And if we could try our best -- I'll try my best if you try your best -- not to talk over each other.

A. Yes.

Q. We'll wait until one of us has finished, and then the next person will -- will go.

A. Right.

Q. That will make it easier for the court reporter to take down the information, as you experienced last time.

A. Correct.

Q. Okay. And --

MS. JOSELSON: I just want to put one thing on the record. You let me know when you're done.

MR. FLEMING: Go ahead, Emily.

MS. JOSELSON: Okay.

So I just want to put on the record that this Court's August 17, 2018, Third Amended Discovery Order is based on the Court's order of September 28,

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2018, in which Judge Crawford made it clear that "The completion of the depositions of plaintiffs' rebuttal witnesses are limited to the opinions in their August 1, 2018, reports. The party shall not use the rebuttal depositions to reexamine the same witnesses on matters already examined in their initial depositions, except that the depositions may inquire into opinions previously offered, but only to the extent reasonably necessary to explore the opinions stated in their August 1, 2018, reports."

I'm sure Counsel will abide by that order.

MR. FLEMING: Thank you.

Q. So I think I left off with us not talking over each other. So thank you, Dr. Hopke.

In addition to that, if you'd try to answer questions audibly, not with a shake of the head yes or a shake of the head no or "uh-huh" or "huh-uh." It's harder for the court reporter to take that down as well. Okay?

A. Right.

Q. And I asked last time if you were taking any medication that would impair your ability to testify.

Have you taken anything that would impair

PHILIP K. HOPKE, PhD - BY MR. FLEMING

your ability to testify here to the best of your ability?

A. No, I have not.

Q. Okay. Thank you, Dr. Hopke.

So, Dr. Hopke, let's just mark a couple of exhibits. I'll put them all in front of you, just to make it more efficient, what's going to be Exhibits 1, 2, 3 and 4.

PHILIP K. HOPKE, PhD - BY MR. FLEMING

(The following exhibits were marked for identification: Hopke EXH 1 through 4, inclusive.)

Q. I'll give you a second to look at those, Dr. Hopke.

MS. JOSELSON: Do you have a copy for me?

MR. FLEMING: I do, if you'll just give me one second.

THE WITNESS: Okay.

(There was a pause in the proceeding.)

MR. FLEMING: Do you have the merits report, Emily?

MS. JOSELSON: I have 1 and 2.

MR. FLEMING: Okay. There's 3.

There should be 4.

If I could take a look at your Exhibit 4, Dr. Hopke.

THE WITNESS: Excuse me?

MR. FLEMING: If I could take a look at it.

Yeah, I think it's the other one there.

MS. JOSELSON: It says 4.

MR. FLEMING: Yeah, I mistakenly gave you that.

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THE WITNESS: You gave me 2.

MR. FLEMING: Yeah. Thank you, Dr. Hopke.

Q. Okay. So, Dr. Hopke, you've got four exhibits in front of you. Have you had a chance to look at them?

A. Yeah.

Q. Okay.

A. They are the materials that I prepared for this case.

(The following exhibit was identified for the record: Hopke EXH 1.)

Q. Right.

So Exhibit 1 is your original class certification report dated September 1st, 2017, right?

A. That's correct.

(The following exhibit was identified for the record: Hopke EXH 2.)

Q. And then Exhibit 2 is the declaration that you submitted in support of class certification dated October 2, 2017, right?

A. Correct.

(The following exhibit was identified for the record: Hopke EXH 3.)

Q. And then Exhibit 3 is your merits report

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that you submitted, and it's dated December 15, 2017, right?

A. Correct.

(The following exhibit was identified for the record: Hopke EXH 4.)

Q. And then finally is your rebuttal report on class certification, and that's dated August 1st, 2018; is that correct?

A. Correct.

Q. So that Exhibit 4 I'll refer to as your rebuttal report today. Okay?

A. Okay.

Q. How much time have you spent working on this case in full, Dr. Hopke?

A. In full? About 62 hours that was not related to the deposition, plus the preposition -- preparation in deposition last time, which was something in the order of 18 to 20 hours. And then about 10 to 12 hours in preparation for this deposition, plus whatever it takes today.

Q. Okay. So I get -- my math with your high range is -- somewhere in the order of about a hundred hours; is that -- is my math right?

A. Yes.

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Q. No, strike that. Sorry. 82 -- 12 -- 94 hours at the high range?

A. Something -- something in that area.

Q. Okay. And how much time have you billed so far in the case?

A. Okay. We've billed all of the -- not -- you know, I -- you know, I don't do the billing. Or Katherine Dare does the billing.

My understanding is that we would have billed out the roughly 62 hours to plaintiff counsel, and I'm reasonably sure that I billed out the deposition to you.

Q. And about how much time do you think you've spent working on the case since your last deposition?

A. The 22 -- 21, 22 hours primarily on the rebuttal, and then the time over this last weekend and yesterday preparing for today.

Q. So since your last deposition, in terms of work you've done, you've worked on your rebuttal report; is that right?

A. Uh-huh.

Q. And you also prepared for this deposition with counsel; is that correct?

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A. That's correct.

Q. Other than in your rebuttal report, have you written about PFOA or APFO since your last deposition?

A. No, I have not.

Q. Have you presented on APFO or PFOA since your last deposition?

A. No, I have not.

Q. Have you brought anything with you to today's deposition relating to the case or APFO or PFOA?

A. Yes. Yeah. I have some odds and ends of things. You know, my copy of the rebuttal report; Mr. Chinkin's report; a small excerpt from the Barr site report from doing the wipe tests; the rebuttal report of Mr. Mears; the rebuttal report of Mr. Yoder; the rebuttal report of Dr. Siegel; the journal papers Barton 2009, Zhu 2007, and Shin 2011.

And I think that's -- that's it.

Q. Is that all, Dr. Hopke?

A. I think so.

MR. FLEMING: Okay. Thank you.

So let's mark that as a composite exhibit, and that will be Exhibit 5, and these are the

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materials that Dr. Hopke just listed that he brought with him to today's deposition that relate to the case or PFOA or APFO.

(The following exhibit was marked for identification: Hopke EXH 5.)

THE WITNESS: Let's put that on something where there's a fair amount of blank space.

MR. FLEMING: And I think I have a clip. My clip is not going to be big enough, but I'll try.

THE WITNESS: I'm not sure that's big enough.

MR. FLEMING: Yeah.

THE WITNESS: Yeah. No, that ain't going to work.

MR. FLEMING: You've worked in an office for a while as well, I take it.

All right. Well, we'll try to keep that together.

THE WITNESS: Try and keep the pile separate.

MR. FLEMING: Yeah, terrific. Thank you.

Q. So, Dr. Hopke, for the 18 to 20 hours, if I understood you correctly, or 22 hours working on

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your rebuttal report, what specifically did you do within those -- within that time?

A. Well, I spent a lot of time, obviously, reading Mr. Chinkin's report.

The other report, whose name I'll get right now, that -- Mr. Fleischer's report.

Obviously, rereading some of the pertinent literature: the Barton paper, the Zhu paper, the Shin paper.

We had a teleconference with Dr. Shin. We've had teleconferences with Mr. Yoder.

And then, you know, a fair amount of writing and rewriting to try and make the rebuttal report as -- as clear but as concise as possible.

Q. Okay. So you recall rereading Barton -- did you say 2009?

A. Yes.

Q. You recall rereading Zhu 2007?

A. That's correct.

Q. And Shin 2011?

A. Yes.

Q. Any other articles that you reviewed since your last deposition that relate to your rebuttal report?

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A. Yeah. I mean I -- I also reviewed the other papers referenced.

Q. I'm sorry to interrupt. Are you reading from your --

A. Rebuttal report.

Q. You're reading from your rebuttal report where?

A. The list of references.

Q. Okay. So the last page, right?

A. Correct.

Q. Thank you.

A. So I -- I reviewed all of those papers.

Q. That are listed on the last page of your rebuttal report, right?

A. That's correct.

Q. Okay. Any other papers beyond that?

A. Not that I can recall.

Q. Since your last deposition, have you visited any processing facilities that may have handled or processed PFOA or APFO?

A. No, I have not.

Q. Did you visit any of the plaintiffs' or anyone else's homes in the area of Bennington or North Bennington?

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A. No, I have not.

Q. Have you conducted any testing yourself related to PFOA or APFO?

A. No, I have not.

Q. Has anyone done any testing of PFOA or APFO on your behalf?

A. No, they have not.

Q. Are you relying on any actual testing data relating to PFOA or APFO for your opinions in this case?

A. No, because the Barr site report with the wipe test came out after I had written the rebuttal report and submitted it. I would have included material from that had it come prior to the -- the due date.

Q. And is that report that you just mentioned within that composite collection that's Exhibit 5?

A. As I say, I've excerpted a small amount of it because it was a very large report.

Q. Okay. Could you pull it out? I would like to mark it as Exhibit 5A.

A. Okay. It's 351 megabytes, so...

(The following exhibit was marked for identification: Hopke EXH 5A.)

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Q. So I'll hand you back what's now Exhibit 5A that was in your Exhibit 5 but now is Exhibit 5A. It was my understanding it's a -- it's a report by Barr relating to wipe sampling?

A. Yes.

Q. And did I understand you to say that you're not relying on that because it came out after you wrote your report?

MS. JOSELSON: Objection.

A. Correct.

Q. I'm sorry. You can answer.

A. That's correct.

Q. Between your original report on class certification and your rebuttal report, do they contain a complete statement of all of the opinions that you intend to express on the issue of class certification in this case?

A. Yes, I believe they do.

Q. Do your original reports -- I'm sorry. Strike that.

Does your original report and your rebuttal report contain all of the bases and reasons for the -- for the opinions that you intend to express on class certification in this case?

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MS. JOSELSON: Objection.

A. I believe they do.

Q. Do both of those reports likewise explain all the facts or data that you considered when forming the opinions on class certification that you intend to express in this case?

A. I believe they do.

Q. Does your rebuttal report introduce any new opinions that were not expressed in your original class certification report?

A. No, it does not.

Q. Is there anything in your rebuttal report that you would like to correct?

A. There is a typo on page 1 under "Sublimation." The Zhu et al. should be 2007, not 2006.

I believe otherwise it is correct.

Q. Okay. And going back to your original report on class certification, other than what you identified at your prior deposition to be corrected, is there anything else you've identified since that deposition that you believe should be corrected in your original class certification report?

MS. JOSELSON: Objection.

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A. I do not think so.

Q. And you had at Exhibit 4, which is your rebuttal report, that last page that listed five references, right?

A. That's correct.

Q. Are those all of the studies that you relied on to form the opinions in your rebuttal report?

A. No. I obviously -- I had the material that I had previously read and referenced in the prior report, and didn't necessarily re-reference them here because they've already been described in prior material.

Q. Okay. I think I understand.

So if I'm understanding you correctly -- please let me know -- for the opinions that you express in your rebuttal report, you're relying on the references cited in your original report, together with the references cited in your rebuttal report; is that fair?

MS. JOSELSON: Objection.

A. That's fair.

Q. Were there any materials that you considered but did not rely on that are not listed in

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either your original report on class certification or your rebuttal report on class certification on the issue of class certification?

A. I don't believe there are any others that I relied on. I reviewed -- you know, there were enormous numbers of documents, and I reviewed a large number of them. But I think I have referenced all of the ones for which I used to base the opinion.

Q. And the articles that are listed on page 5 of Exhibit 4, which is your rebuttal report on class certification, how did you get those materials?

A. I downloaded them from the -- from the web.

Q. And what were you looking for?

A. Again, trying to further document the mechanism that I had espoused, and further under -- you know, again, to provide -- to provide some additional clarification to the original statement of -- of the nature of the chemistry going on as -- as I believe it is occurring.

Q. And when you were trying to further document the mechanism that you espoused, when did you espouse the mechanism that you're referring to?

MS. JOSELSON: Objection.

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A. In the original classification report.

Q. And what mechanism did you espouse in the original class certification report that you were trying to further document in your search for your rebuttal report?

A. That the PFOA would volatilize prior to any opportunity to decompose into -- through decarboxylation into a non-octanoic acid entity.

THE WITNESS: Sorry about that.

Q. And in your original report, am I correct that you believed that the pH of the solution would determine the extent to which there would be the formation of PFOA?

A. No.

MS. JOSELSON: Objection.

A. No. It's because the -- the volatilization is not coming from solution, and I never indicated it was coming from solution. Or I don't believe I ever indicated it was coming from solution.

Q. If you did indicate that it was coming from solution, you would have been wrong about that; is that fair?

MS. JOSELSON: Objection.

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A. It would have been a misstatement.

Q. Let me just state it this way: If you did indicate it was coming from solution, you don't agree with that as you sit here today?

A. That's correct.

Q. So if it's not coming from solution, what's the mechanism for this volatilization that you were looking to support in your search for your rebuttal report on class certification?

MS. JOSELSON: Object to the form.

A. Okay. Again, as -- as I outlined in the rebuttal, what I believe is happening -- and, in fact, is, to some extent, what Mr. Chinkin puts in his -- is as the material dries, you're going to form ammonium perfluorooctanoate crystals.

Q. APFO crystals?

A. APFO crystals, on -- at that -- at -- based on Barton and Zhu, et al., there will be a transfer of a hydrogen from the ammonium to the PFO minus. The ammonia will be volatilized from the solid, and the PFOA will then sublime from the surface.

And that occurs at temperatures substantially below the point at which the PFOA will

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decarboxylate. It will happen during the drawing process and move away from the fabric as they substantially move the air away in order to keep the relative humidity above the drawing cloth low enough to effectively dry the material.

There may be some additional sublimation as it moves into the next zone, but it will all have sublimed before -- at those temperatures, again, before it has any chance to decarboxylate. And the decarboxylation could not have happened without the loss of ammonia.

Q. I think we'll be discussing that more today. Thank you, Dr. Hopke.

The opinion that you just expressed, can you cite any data from any processing facility, any actual test data, that supports what you just said?

MS. JOSELSON: Object to the form.

A. I was unable to find any.

Q. Let me see if I can turn to some more background, Dr. Hopke.

Have there been any updates to what I'll call your professional activities since we last met at your deposition?

A. Again, I've published another number of

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papers. I don't remember exactly how many I had in early April. I'm now up to 683 peer-reviewed journal papers.

I was recently awarded the Fissan-Pui-TSI Award by the International Aerosol Research Assembly.

I continue to -- to work with a variety of institutions. I've been at Nankai University in Tianjin and Tsinghua University in Beijing, doing joint research.

Q. And have any of the papers that you just mentioned that you published since your last deposition relate -- related to PFOA or APFO in any way?

A. No, they are not.

Q. The award that you just mentioned you won -- and congratulations for that -- does that relate to PFOA or APFO in any way?

A. No, it does not.

Q. The collaboration work that you just mentioned with those universities overseas, did that collaboration work relate to PFOA or APFO in any way?

A. No, it is not.

Q. Do you have an updated copy of your CV?

A. I can send one or I can provide one to

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counsel.

MR. FLEMING: We would request an updated copy of your CV.

(Document request - Updated copy of Hopke curriculum vitae)

THE WITNESS: Sure. I'll do that when I get home.

MR. FLEMING: Okay.

MS. JOSELSON: So I'll just ask that any document requests you submit during this deposition, you submit in writing form following the deposition, and we will respond as appropriate.

Q. "Standard pressure," Dr. Hopke -- is "standard temperature and pressure" a standard chemical term used to describe a precise set of conditions?

MS. JOSELSON: Objection.

A. Yes.

Q. And what's the temperature and pressure for standard temperature and pressure?

A. One atmosphere, zero degrees Celsius.

Q. Is it fair to say it's pressure of 1 times 10 to the 5th power pascals?

A. It would be 1 -- it would be 101.43

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kilopascals, if I remember correctly.

Q. Now, we already discussed some of these terms, but I think it's useful to maybe just go over them again at the outset here.

"Volatility." What is volatility, Dr. Hopke?

MS. JOSELSON: I'm going to object to this line of questioning, which was asked and answered in the first deposition.

MR. FLEMING: Thank you.

A. Okay. "Volatility" is a -- is a nonprecise term with regard to the ability of a liquid or solid to move into the gas phase.

Q. Would you say -- would you agree it's the tendency of a substance to vaporize?

MS. JOSELSON: Objection.

A. Yes, but it's not -- not quantitative.

Q. Is it the same thing as sublimation?

A. Sublimation is a process for solid to move into the gas phase.

Q. Is "volatilization" a simplified term for sublimation?

MS. JOSELSON: Objection.

A. No. It covers both liquid and solid

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transformation into vapors.

Q. And how about "vaporization"? What is vaporization?

A. That's the conversion of a liquid into a vapor, under normal -- normal terminology.

Q. Is vaporization the same thing as sublimation?

A. No.

Q. Do you use those terms interchangeably?

A. I shouldn't. I hope I have not done so.

Q. And then how would you define "sublimation"?

A. Sublimation is the movement of molecules directly from a solid into the vapor phase.

Q. And is that the same thing as evaporation?

A. Evaporation is normally associated with liquids moving into the vapor phase.

Q. Is sublimation the same thing as decomposition?

A. No.

Q. Is sublimation the same thing as dissociation?

A. No.

Q. Let's talk about vapor pressure for a

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moment, Dr. Hopke.

Are higher vapor pressures more volatile than lower vapor pressures?

MS. JOSELSON: Again, I'm objecting to this entire line of questioning as asked and answered in the first depo.

A. Yes.

Q. Is ice in a freezer set near zero degrees generally volatile or stable?

A. There will be some sublimation from ice.

Q. So would you --

A. Depending -- depending on how closed the system is, so that it -- because it will depend on the relative humidity above the ice as to determining the chemical potential for the movement of molecules into the vapor phase.

Q. Do you happen to know the vapor pressure of ice at negative 16 degrees Celsius, 3.2 degrees Fahrenheit?

A. No, I don't know offhand. I would have to look it up.

Q. If I told you it's 150.6 pascals, would you say that ice water is volatile or stable at negative 16 degrees Celsius?

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MS. JOSELSON: Object to the form.

A. It depends on what the overpressure is.

Q. How much ice -- how long do you -- strike that.

How long do you think it would take ice to sublime within a freezer at that temperature?

MS. JOSELSON: Objection.

A. It's impossible to say. You haven't given an adequate description of the conditions.

Q. So how would you be able to determine that?

MS. JOSELSON: Objection.

A. Again, it could be modeled if we knew the mass of the ice, if we knew the actual pressure, if we knew what the relative humidity was.

I mean, again, if we have a closed container, then you will come to equilibrium, and we could model equilibrium conditions.

If we have an open system where there is exchange of -- of vapor, then we would need to know what the change rate is, etcetera, etcetera.

So it's not -- not something that could be answered simply.

Q. So if you were to model it -- if you

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wanted to model it, you would need to know all of those factors that you just identified to figure out the rate of sublimation; is that fair?

A. And I would also need to know the surface area.

Q. Which you mentioned is another factor.

A. Right.

Q. Okay. Or, instead of modeling it, you could actually conduct a test, right?

A. Potentially.

Q. You couldn't conduct a test to figure out the degree of sublimation?

A. Yeah. Again, I would need adequate laboratory equipment and -- I mean I could -- I could design an experiment.

Q. Okay. To figure out the rate of sublimation.

A. Right.

Q. Dr. Hopke, can APFO sublimate?

A. Yes. Based on Barton.

Now, the mechanism is as I described before. Based on the work of Zhu, the transfer of the proton from the ammonium to the PFO minus to produce PFOA, the release of the ammonia, and then the

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sublimation of the PFOA.

Q. So you may have answered my next question, but I'll ask it to make sure.

Can PFOA sublimate?

A. Yes.

Q. Can APFO sublimate in solution?

A. No, because it will be dissociated into ammonium and PFO minus.

Q. Is it fair to say that in solution, in Saint-Gobain's or CHEMFAB's coating fabric solutions, the vast majority of the perfluorooctanoate is in the PFO minus form?

MS. JOSELSON: Objection.

A. At the pHs described, that would be true.

Q. Can you quantify how much that vast majority is?

A. Not directly. I would have to -- you know, again, given that the pKa is around 3.3 and the pHs were -- again, we know what the pH of the dispersant was, but once you add water, that would lower the pH. So I don't know what the precise pH was in the actual solutions as used.

Q. How about the PFO minus? Can that sublimate at all?

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A. No.

Q. Can PFOA sublimate in solution?

A. PFOA would only exist at pHs below 3 point -- well, below about 4 1/2 to 5. And then it would be 50-50 at the pKa, which is something like 3.3.

There would be -- again, you would not -- you would have the potential for weak vaporization. It would not be sublimation in this case because it's going from solution.

Q. I think -- let me make sure I understand it. I think you got to it at the end.

But the PFOA in solution, can PFOA in solution sublimate?

A. No.

Q. Is PFO minus volatile?

A. No.

Q. In fact, it can't volatilize, right?

A. It wouldn't volatilize.

Q. Even when the solution is heated, right?

A. Yes.

Q. How about APFO? Is APFO volatile?

A. No.

Q. Is PFOA volatile?

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A. Yes. That's -- it has -- it has a vapor pressure.

Q. Does APFO have a vapor pressure?

A. Not directly, no.

Q. Can you cite any paper that would say that APFO does not have a vapor pressure?

MS. JOSELSON: Objection.

A. No. I mean, you know, again, the Barton et al. 2009 paper is looking at the sublimation, but they are hypothesizing the dissociation of the APFO into ammonia in PFOA and the subsequent sublimation of the PFOA. So that the effective sublimation of APFO is actually a two-step process.

Q. Let me see if I can try to ask this question just specifically to see if I can get an answer to the specific question.

Can you cite any paper that says APFO does not have a vapor pressure?

MS. JOSELSON: Asked and answered.

You can answer it again.

A. Not to my knowledge.

Q. Okay.

A. I mean...

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MS. JOSELSON: Were you still talking?

THE WITNESS: No. No. I'm better.

Q. When Saint-Gobain -- excuse me.

When Saint-Gobain or CHEMFAB received materials at its facilities, did they come in the form of APFO or PFOA? Can you explain your opinion on that?

MS. JOSELSON: Objection.

A. As I understand it, they would come as -- primarily would come as solutions, which means that you would have the, you know, ammonium ion and the PFO minus in the solution, and they would...

And so they had, as I understand it, again, both the dispersant, which would have the Teflon particles, and the surfactant.

And they also had some additional surfactant, because they -- as I understand it, they also occasionally added additional surfactant to the system.

Q. And if I was understanding your testimony earlier and your rebuttal report, you believe that the PFO minus and the ammonium ion in solution ultimately will form a solid APFO; is that correct?

A. As the -- as the solution dries.

PHILIP K. HOPKE, PhD - BY MR. FLEMING

Q. As the solution dries.

A. As reported by Mr. Chinkin's comments on my dep -- on my report.

Q. Are you relying on Mr. Chinkin's opinion?

A. Absolutely not. It just -- he agrees with my mechanism.

Q. Where is this solid APFO formed?

A. On -- it's going to form primarily, I think, on the surface of the Teflon particles, but it could also form on the surface of -- surface of the fabric.

Q. How long does it take for the solution to be dried off in Saint-Gobain's processes?

MS. JOSELSON: Object to the form.

A. I don't know. I mean they --

Q. How long -- I'm sorry. Go ahead if you weren't finished.

A. Again, they have presumably designed the process to maximize the speed of that evaporation. Exactly what they've done, I'm not sure.

Q. And can you quantify that speed in any way?

A. No, I cannot.

Q. How long does it take for the APFO solid

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to be formed? Can you quantify that in any way?

A. No, I cannot.

Q. Now, when the APFO solid is formed, in your opinion, does any of the PFO minus and ammonium ions stay in solution in the evaporating water during the drying process, in your opinion?

A. If it's still in -- if it's still in the liquid phase, it would still be in the ionic form.

But, as we have said, as -- as the water vapor goes off, you're going to wind up with these small crystals of -- of APFO.

Q. And I think you referred to Zhu -- that's Z-H-U, right? --

A. Uh-huh.

Q. -- before and in your report; is that correct?

A. That's correct.

Q. And you cite a formula -- you can take a look at your rebuttal report if it's helpful --

A. Uh-huh.

Q. -- on page 1 of your report, about four-fifths of the way down, right?

A. Uh-huh.

Q. Starting with Na4?

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A. Correct.

Q. And what is that -- that formula, Dr. Hopke? What does it provide?

A. Okay. Again, it provides a schematic description of the fact that we have the formation of the solid ammonium -- well, APFO.

We then have the transfer of a hydrogen from the ammonium to the PFO minus. That's the second entity.

At that point, then, the ammonia will volatilize off from the surface of this crystal, and we will be left with PFOA.

The PFOA then can sublime into the gas space.

Q. And how did you come up with this formula, Dr. Hopke?

A. Well, it's basically the same approach that I've had all along; it just -- it seemed we needed to have greater explication of the mechanism in order to provide clarity.

Q. Your original report didn't mention sublimation, right?

MS. JOSELSON: Objection.

A. No, it did not.

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Q. But it had -- I'm sorry if you were going to say something.

A. No.

Q. But how did you come up with this -- I'm understanding you to say that you believe this was your opinion all along.

But whenever it was your opinion, how did -- how did you come up with this particular formula? What are you basing it on? What's your support for it?

Let me -- let me strike that. I'll ask one question.

What's your support for this formula that you cited on page 1 of your rebuttal report?

A. Okay. The proton transfer is analogous to what Zhu reports, and it's also what Barton et al. hypothesize as the mechanism for the sublimation they see in their 2009 paper.

Q. Now, Zhu is based on ammonium chloride, right?

A. That's correct.

Q. Not APFO?

A. That's correct.

Q. Not PFOA?

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A. That's correct.

Q. Not a salt -- I'm sorry. Not an acid?

MS. JOSELSON: Objection.

A. What are you --

Q. Strike that, unless you want to comment.

A. What's not an acid?

Q. Okay. Strike -- I'll -- I'll rephrase or skip the question. I'll withdraw the question.

A. Okay.

Q. So is this formula based on -- strike that.

You cite Zhu 2007 to support this formula that you have on page 1; is that fair?

A. That's correct.

Q. Do you find the conclusions of Zhu to be reliable as it relates to your opinions in this case?

A. Yes.

Q. And those are the conclusions about the scheme or formula that Zhu proposed for the sublimation of ammonium chloride, right?

A. That's correct.

Q. And have you concluded that the mechanism that Zhu suggested applies to APFO or PFOA?

A. Yes. By analogy, it should be the same.

PHILIP K. HOPKE, PhD - BY MR. FLEMING

Q. Have you concluded to any reasonable degree of scientific certainty that Zhu's mechanism applies to APFO or PFOA?

A. I have a high degree of probability that that is, in fact, correct.

Q. Do you have a reasonable degree of scientific certainty?

You're looking at your attorney.

A. No. I mean I'm just trying to -- I mean I'm -- I'm quite certain that that is, in fact, the case.

Q. What would you have to do to form a reasonable degree of scientific certainty that Zhu's mechanism that Zhu proposed applies to PFOA or APFO?

MS. JOSELSON: Objection.

A. Again, we have the evidence of the Barton et al. work showing that, in fact, the APFO sublimes.

So, you know, the combination of the two papers makes it very clear that this is a very highly probable mechanism by which this occurs.

Q. And was it Barton you just said?

A. Right.

Q. Right.

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A. In 2009.

Q. Did Barton say it was highly probable that this mechanism occurs with APFO or PFOA?

A. They hypothesized that that was the -- how they explained it.

Q. Did they describe it as highly probable, like you just did?

MS. JOSELSON: Objection.

A. They did not describe it in -- they did not describe it in those terms.

Q. Have you identified any peer-reviewed paper that concludes that this sublimation mechanism from Zhu, as set out in your rebuttal report, actually applies to APFO or PFOA?

MS. JOSELSON: Objection.

A. Again, the Barton report refers to Zhu and uses it as its hypothesis for what they were observing.

Q. Did Barton conclude that the Zhu mechanism for ammonium chloride actually does apply to APFO or PFOA?

MS. JOSELSON: Objection.

A. Again, in science one provides reasonable hypotheses.

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They did not, for example, measure the ammonia, and so they would not have been in a position to have all of the details needed.

Q. So they hypothesized that it may apply; is that fair?

MS. JOSELSON: Objection.

A. Yes, but it's -- again, the reasonable -- again, chemists reason by analogy. And this -- we have very good evidence from Zhu. We have the sublimation at -- in Barton. The analogous mechanism is, therefore, highly plausible.

Q. Did you find the sublimation of ammonium chloride in Zhu to be an appropriate comparator when considering the sublimation of APFO and PFOA?

MS. JOSELSON: Asked and answered.

You can answer it again.

A. Yes, because it's logical for the hydrogen transfer, the proton transfer from the base group from the ammonium to the acid group. In that case, the acid is hydrochloric acid; in this case, it's PFOA.

Q. Are there other salts that are good analogs for APFO with regard to sublimation?

A. I don't know. I haven't looked.

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Q. Is ammonium perfluorobutanoate a salt?

A. Yes.

Q. Do you think that would be a good analog for ammonium perfluorooctanoate?

A. Not -- not sure. A smaller chain may have somewhat different properties.

Q. You think it's a better analog than ammonium chloride for APFO?

A. I wouldn't want to speculate without looking further.

Q. You would have to look further to have an expert opinion on that question?

A. That's correct.

Q. Does perfluorobutanoate have multiple fluorine atoms attached to the carbon, as with APFO?

A. Yes, it would.

Q. Does perfluorobutanoate have a carboxyl group, as with APFO?

A. Yes.

Q. Does ammonium chloride have any fluorine or any carbon atoms?

A. No.

Q. Does ammonium chloride have any carboxyl group?

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A. No.

Q. Does ammonium chloride undergo thermal decomposition or decarboxylate?

A. It undergoes dissociation and volatilization via the mechanism of Zhu, but it would not have decomposition.

Q. Would ammonium chloride decarboxylate?

A. No. It cannot.

Q. Can ammonium perfluorobutanoate decarboxylate?

A. Potentially.

Q. You may take a look at the Zhu paper that you cite as a reference.

MS. JOSELSON: I like to take a break every hour. So it's been about an hour. You let me know when you're ready.

MR. FLEMING: Sure. Why don't I mark this paper, Emily, and I'd be happy to do that.

MS. JOSELSON: After the break?

MR. FLEMING: No. I'm going to mark it now, since the question was relatively pending before you requested it. So I'll just complete this thought that I had before break, if I may. It will only be a minute or two, if that's all right.

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MS. JOSELSON: I don't think there's a question pending.

MR. FLEMING: So I think we're on Exhibit 6.

THE WITNESS: Or we can make it 5B.

MR. FLEMING: Oh, is it in your stack?

THE WITNESS: Yeah.

MR. FLEMING: Okay. That's a fair point. Thanks, Dr. Hopke. Maybe that will speed it up too.

So we're going to mark not Exhibit 6, but Exhibit 5B, because Dr. Hopke has his own paper -- own copy of the paper that is Zhu 2007.

Q. And again, Dr. Hopke, this is Zhu 2007. This is the same Zhu that you're relying on in your rebuttal report, right?

A. That's correct.

Q. And your rebuttal report -- just to be clear, not to belabor it -- referred to it as Zhu 2006. But it's Zhu 2007, right?

A. Right. It's a typo.

MR. FLEMING: So let's mark this as Exhibit 6A [sic], and then we can take a break for Ms. Joselson.

(The following exhibit was marked for

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identification: Hopke EXH 5B.)
MR. FLEMING: So 2007 is 5B.
THE WITNESS: That's correct.
MR. FLEMING: Thank you for the correction.
THE VIDEOGRAPHER: The time is 10 o'clock. We're off the record.
(The proceeding recessed at 10:00 a.m.)
(The proceeding reconvened at 10:07 a.m.; appearances as before noted.)
THE VIDEOGRAPHER: The time is 10:08. We're back on the record.
MR. FLEMING: All right. We're back on the record.
PHILIP K. HOPKE, PhD, resumes;
CONTINUING EXAMINATION BY MR. FLEMING:
Q. Are you ready to go, Dr. Hopke?
A. Yes, I am.
Q. Thank you.
So you have Exhibit 4 in front of you, Dr. Hopke, which is your rebuttal report at page 1. It's that formula?
A. Uh-huh.
Q. And then if you have Exhibit 5B, which is

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Zhu 2007, there's a formula there on page 13831.

I would like to ask you about both of those. Okay?

A. Yes.

Q. So in your rebuttal report, Dr. Hopke, underneath the formula, it has what I'll call a legend. The formula refers to, among other things, an "s," an "a," and a "g"; is that fair?

A. That's correct.

Q. And you write in your report that the "s" represents solid crystals; is that correct?

A. That's correct.

Q. "A" represents material on the crystal surface; is that correct?

A. That's correct.

Q. And "g" represents the gas phase; is that correct?

A. That's correct.

Q. And then if you take a look at the Scheme 1 of Zhu in the article that is 5B, on page 13831 there's a scheme there that -- that your scheme mimics; is that fair?

A. That's correct.

Q. And if you turn to page 13833 -- I'm

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sorry. Strike that.

If you turn to page 13831, you'll see those same codes, if you will, in the left column.

So I'll read it. It refers to Scheme 1, where "s" denotes solid, just like yours, right?

A. Yes.

Q. "A" denotes absorb species.

Is that the same as yours?

A. Yes.

Q. And "g" denotes the gas phase species, right?

A. Correct.

Q. So you're following Scheme 1 in Zhu; is that correct?

A. That's correct.

Q. And in terms of what's going on with these -- with this scheme, am I right that there are three steps here?

Do you see in Zhu where it refers to "1," "2," and "3"? That's Scheme 1.

A. Yeah. I mean -- yes, basically it's -- you know, it's the same mechanism by analogy.

Q. And is Step 1 showing internal rearrangement?

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Is that fair?

A. Yes.

Q. And is Step 2 showing dissociation?

Is that fair?

A. Yes.

Q. And Step 3 is desorption?

A. Yes.

Well, again, it depends on how you -- you can talk about it as desorption; you can talk about it as sublimation. I mean the overall process of converting the solid into the vapor is sublimation. The individual step might be just -- might be desorption.

Q. But is this Scheme 1 important to your opinion on sublimation for PFOA or APFO?

A. It provides support to the idea that sublimation would be important for PFOA.

Q. What did you do to satisfy yourself that this mechanism that is Scheme 1 is actually correct, if anything?

A. Again, it -- it, in combination with Barton 2009, provide a very -- a highly certain support for the fact that they can see the sublimation of APFO.

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Q. Can you cite anyone who adopts this Scheme 1 from Zhu for PFOA or APFO?

A. Well, again, Barton uses it as their hypotheses for what they're seeing with the APFO.

I have not extensively looked to see if it has been replicated elsewhere for other ammonium salts.

Q. Can you cite any paper that adopts Scheme 1 even for ammonium chloride?

A. I have not looked.

Q. So what's your support for concluding that Scheme 1 would apply to ammonium chloride?

A. Because it -- it fits what we would know about the likely chemistry in this case.

Q. But even -- even Zhu doesn't believe that Scheme 1 applies to the sublimation -- strike that.

Even Zhu doesn't believe that Scheme 1 applies to ammonium chloride; isn't that right?

A. No, that's not correct.

Q. Did you read Zhu thoroughly, Dr. Hopke?

A. I believe so.

Q. If you'd turn to page 13835.

A. Yes.

Q. Do you see at section 3.6 --

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A. Yes.

Q. -- do you see where Zhu -- reading from, again, Exhibit 5B -- says, quote, "On the basis of the above discussion, we suggest that the sublimation/dissociation reaction is a multi-stage process which takes place as shown in Scheme 2."

A. Uh-huh. Which is a little more complicated, but it's not very different. I mean it still represents a similar overall process.

Q. Why is it that you choose to rely on Scheme 1 when the paper you cite, Zhu, actually rejects Scheme 1 and proposes Scheme 2?

MS. JOSELSON: Objection.

You can answer.

A. Again, I'm trying to present this material in a way that is more easily understood. And the fact that Barton -- you know, again, the combination of the Barton and Zhu suggests that this approach is a -- is a good explanation of what's going on.

And clearly there has to be the proton transfer to the chlorine in order to provide the sublimation of the ammonium chloride.

Q. You're relying on Zhu 2007 for your opinions in this case, right?

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A. Yes.

Q. Zhu adopts Scheme 2, not your Scheme 1, right?

MS. JOSELSON: Objection.

A. Yes. Yeah.

Q. Can you cite any other researcher that rejects Zhu's proposal that Scheme 2 applies with respect to sublimation?

A. No.

Q. Can you cite any other researcher that adopts Scheme 1 which Zhu did not propose in its paper that you're relying on?

MS. JOSELSON: Objection.

A. No.

Q. Have you, before this deposition, considered in any way how the application of Scheme 2 instead of Scheme 1 could affect your opinions in this case?

A. Yes, I've reviewed it. I didn't see that it made a major difference, because this is describing the equilibrium configurations on the ammonium chloride.

So, again, we're getting more complex, and in that -- again, trying to explain this in -- in

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terms that made easy sense, I chose to adopt Scheme 1. They're not that substantially different in -- in underlying chemistry.

Q. If we take a look at Scheme 2, Dr. Hopke, in Zhu, which Zhu proposes is the actual --

A. Uh-huh.

Q. -- mechanism for sublimation of ammonium chloride, is it fair to say that there are three codes there?

There's "C," which refers to the crystalline structure, right?

A. Uh-huh.

Q. There's "S," which refers to the relaxed surface, right?

A. Yes.

Q. And then there's "G," which refers to the gas phase, right?

A. Correct.

Q. Am I right that in the first phase of the three here, we have surface reconstruction?

A. That's what's proposed.

Q. And am I right in the second phase, we have sublimation and surface desorption?

A. Yes.

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Q. And then finally we have dissociation; is that right?

A. Yes.

Q. Have you researched the relative rates of volatilization of APFO and PFOA since your last deposition, Dr. Hopke?

A. No, I have not.

Q. So as you sit here today, can you quantify the rates of volatilization for APFO versus PFOA?

A. No, I cannot.

Q. At page 1 of your rebuttal report, Dr. Hopke, you state that -- you refer to the sublimation process, and you say it's "slow" -- quote, "slow at room temperature, but it increases as the temperature increases"; is that right?

A. That's correct.

Q. Have you calculated that rate of sublimation for PFOA or APFO?

A. No. I relied on Barton 2009.

Q. Have you calculated it at any given temperature?

A. No, I have not.

Mr. Chinkin's report also indicates it would sublime at 130 C.

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Q. What would sublime at 130 degrees Celsius?

A. PFOA.

Q. How -- how quickly would it sublime? What would the rate be, Dr. Hopke?

A. We don't know. I don't know. Again, it depends on the crystal size and other conditions.

Q. And do you have any data that would show you the crystal size or those other conditions?

A. No, I do not.

Q. Have you looked for that data?

A. Yes.

Q. Where did you look?

A. I searched the literature. No one has really looked in detail at this corporate process.

Q. You haven't seen any reports or test data that would -- that would show you the rate of loss relating to PFOA or APFO?

A. No, I have not.

Q. And your rebuttal report discusses the decarboxylation of PFOA; am I right about that, Dr. Hopke? At page 2?

A. Yes.

Q. Under what conditions, in your opinion, does the decarboxylation of PFOA occur?

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A. At -- again, based on the literature, at temperatures above 165 C. But it's the decarboxylation of PFOA, not the decarboxylation of APFO.

Q. And what are you relying on to say that PFOA decarboxylates beginning at above 165 degrees Celsius?

A. There was -- okay. I'd have to go back and look for it. There was materials properties that indicated it started to decompose at 165.

And then, of course, there was also the Krusic papers, showing that it decarboxylated at high enough temperatures.

Q. And what's the rate of decarboxylation at 165 degrees Celsius?

A. I don't know.

Q. Can there be -- can there be decarboxylation of APFO, Dr. Hopke?

A. No.

Q. Can you cite any papers that say that APFO won't decarboxylize?

A. Not directly, no.

Q. Can you cite any papers that say that APFO won't decompose?

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A. No.

Q. Are you aware of papers that say that APFO can decompose?

A. Yes.

Q. Are you relying on those papers for your opinions here?

A. I am -- I have certainly included looking at the -- at the Krusic papers.

Q. And do you reject Krusic's findings about APFO and decomposition?

A. Yeah. Again, the -- again, the question is what's the underlying mechanism. Is it -- what we're thinking happens is that we have to have the volatilization of the APFO into PFOA, and then the subsequent decarboxylation.

Because you've got to get to the point where you have the acid, because then you can get the hydrogen transferring back to the carbon atom and release the CO2. But it's not going to happen if there's the ammonia attached to the acid group, ammonium attached --

Q. Let me make sure --

MS. JOSELSON: Let him finish first.

MR. FLEMING: Thank you.

PHILIP K. HOPKE, PhD - BY MR. FLEMING

Q. Were you finished, Dr. Hopke?

A. So it's the ammonium that's attached to the carboxylic acids.

Q. Thank you.

And, Dr. Hopke, I don't certainly mean to interrupt you. So if there's ever a time where we're speaking over each other --

A. Yeah.

Q. -- you know, definitely let me know that.

MS. JOSELSON: I'll let you know.

A. I think we've been working better this time.

Q. What's that?

A. I think we've been working better this time.

Q. I think so too. I think so too.

So let me see if I understand, Dr. Hopke. Do you agree or disagree with Krusic's conclusions about APFO and decomposition?

A. Again, it will decompose into his circumstances because he's got a closed container. And the PFOA, once it's released from the APFO, then is heated to a temperature at which it can decarboxylate.

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If, on the other hand, you have an open system where the material can move away from the heat into the ventilation system and up the stack, it's going to remain as PFOA because it's not going to be at a high enough temperature long enough to decarboxylate.

Q. Can you cite any paper or any test data that supports the view that APFO would decompose only in that closed container that Krusic used?

A. No.

Q. So let's take a look at the Krusic and Roe papers.

Give me a moment and I'll get them.

A. Okay. Yeah, I didn't bring those.

Q. Sure.

A. We went all through those last time.

MS. JOSELSON: I'll object.

MR. FLEMING: This is Exhibits 6 and 7.

(The following exhibits were marked for identification: Hopke EXH 6 and 7.)

Q. So, Dr. Hopke, I've handed you two sets of papers marked Exhibit 6 and Exhibit 7.

A. Uh-huh.

Q. And they're both by Krusic, right?

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A. Yes.

(The following exhibit was identified for the record: Hopke EXH 6.)

Q. Exhibit 6 is Krusic 2004, right?

A. Yes.

(The following exhibit was identified for the record: Hopke EXH 7.)

Q. And Exhibit 7 is Krusic 2005, right?

A. That's correct.

MS. JOSELSON: I'm going to object to this entire line, as I have been, as having been asked and answered and relating to the first deposition.

Q. Dr. Hopke, Krusic and Roe in 2004, Exhibit 6, measured the decarboxylation rate of APFO in glass, right?

A. Yes.

Q. And in particular, they measured it by measuring the decarboxylation product of APFO, which is 1H-Perfluoroheptane, right?

A. Yes.

Q. And if you take a look at page 3800 in the second sentence, do you see where it says, quote, "We find that APFO cleanly decomposes by first-order kinetics to give the hydrofluorocarbon

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1H-Perfluoroheptane, and is completely decomposed, greater than 99 percent in a matter of minutes at the upper limit of this temperature range."

Did I read that correctly?

A. Yes.

Q. And do you agree with that statement, Dr. Hopke?

A. I believe that that's what they reported.

Q. Do you believe that those results are reliable?

A. I have no reason not to.

Q. Do you believe that those results are reliable as applied to Saint-Gobain's or CHEMFAB's processes?

A. No.

Q. And is that because this test was done on glass?

A. And at temperatures higher than I think the PFOA would actually experience. But even here it's still a question of what the underlying mechanism is.

And, again, I would suggest to you that the underlying mechanism is the sublimation of the PFOA, followed by the decarboxylation at these higher

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temperatures.

Q. You also cite Krusic 2005 at page 2 of your rebuttal report, right?

A. Yes.

Q. And am I right that Krusic 2005 reports on APFO decarboxylation as well?

A. No. I think it reports on PFOA decarboxylation.

Q. Doesn't it also report on APFO decomposition not in glass, but in quartz?

A. In quartz, yeah. And it's very slow.

I'd have to go back and -- I did not reread this over the weekend, so...

Q. But am I right that --

MS. JOSELSON: Let him just review the document that you've handed him.

MR. FLEMING: He can take all the time that he would like --

MS. JOSELSON: Thank you.

MR. FLEMING: -- to review the document.

Q. Dr. Hopke, would you like more time to review the document?

A. Yes, just please --

MS. JOSELSON: He just said he did, Doug.

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MR. FLEMING: Emily, please don't obstruct the deposition. Please don't.

MS. JOSELSON: Please don't interrupt the witness --

MR. FLEMING: I'm not interrupting the witness.

MS. JOSELSON: -- when he's reviewing a document.

MR. FLEMING: Come on. I'm being very respectful, and I've had a lot of forbearance with your objections. So I'd ask you to please stop --

MS. JOSELSON: I've had a lot of forbearance with your questions --

MR. FLEMING: -- so we can continue with the deposition.

MS. JOSELSON: -- that continue to ask questions from the first deposition. So we're mutually respectful.

MR. FLEMING: Emily, you're aware that this report is cited in his rebuttal report, aren't you?

MS. JOSELSON: Yes, and I'm asking you to give him a moment to read it.

MR. FLEMING: And I said I would. Of

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course I will.

Q. Dr. Hopke, if there's any time you would like to review a document --

MS. JOSELSON: Just be quiet and let him read, Doug.

MR. FLEMING: No, you can't tell me to be quiet, Emily.

MS. JOSELSON: He's trying to read the document.

MR. FLEMING: I'm taking a deposition. I'm trying, actually, to adhere to what you're telling me.

MS. JOSELSON: Then be quiet and let him read.

MR. FLEMING: Don't tell me to be quiet, Emily. That's not professional or respectful.

Q. Dr. Hopke, if there's any time you would like to review a document, would you let me know that?

A. Certainly.

Q. Thank you.

A. I don't see any indication that they looked at APFO in this paper. It all seems to be PFOA, unless I'm missing something on a quick read.

Q. Okay. So if you'd take a look at page

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1514, Dr. Hopke.

A. Yes.

Q. And do you see above number 4, "Experimental"?

A. Yes. Yeah, okay.

Q. So it's there, right?

A. Yeah. I missed it.

Q. Okay.

MS. JOSELSON: Would you like more time to review it, now that you've found it?

THE WITNESS: Okay. That's a strange paper, because "Conclusions" come before "Experimental." That's -- that's what confused me.

Okay. So I need to find out what the conditions were. That's where they put it with the crushed glass, if I remember correctly.

MS. JOSELSON: Dr. Hopke, just take your time to review the document if you need to.

THE WITNESS: Okay. I have trouble understanding how they -- yeah, I had trouble -- yeah. If you look at all of the figures --

MS. JOSELSON: I don't think there's a pending question.

THE WITNESS: Huh?

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MS. JOSELSON: I don't think there's a pending question. So you just complete your review, and when you've completed it, you can let Doug know.

THE WITNESS: Okay.

Q. Dr. Hopke, were you about to comment on something that you found important from your review? Can you explain what you were about to say?

MS. JOSELSON: Object to the form.

A. Yeah. All of the figures show PFOA. So the conclusion with regard to APFO does not seem to be supported by any of the data presented in the paper.

Q. And to make sure we have a frame of reference, Dr. Hopke, again this is Exhibit 7 that you've been reviewing, right?

A. Yes.

Q. And Exhibit 7 is cited in your rebuttal report, right?

A. Yes.

Q. You had reviewed -- did you review Exhibit 7 in connection with your original report on class certification back in April?

A. Yes, I did.

Q. So you've had a lot of time to review this article, other than at this deposition -- in addition

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to this deposition today, right?

A. Right. But there has been lots and lots of things to review, and -- and I did not specifically go back and look at this one for this deposition, because we covered it in detail in April.

Q. This is -- you're looking at your attorney. Is there any reason?

MS. JOSELSON: Yeah. Because the Court's order, Doug, is that you're not to revisit questions that were asked and answered in the first depo. That's why he's looking at me, because I explained to him what the Court ordered.

Q. Okay. So you cited this again in your rebuttal report that I'm taking your deposition on today, right? This Krusic paper that we're talking about?

A. Yes.

Q. Now, Krusic in 2005 states, does he not, "By contrast, the pyrolysis of the ammonium salt APFO is more facile by orders of magnitude and proceeds by first-order kinetics at essentially the same rates in both quartz and borosilicate ampoules."

Did I read that correctly?

A. Yes, that's what it says.

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Q. So according to Krusic and Roe -- which you're relying on, right?

A. Yes, but there's no data presented for APFO.

Q. According to Krusic and Roe, APFO decomposed at essentially the same rates not just in glass, right, but in quartz as well, right?

A. That's what they say, but --

Q. Can you --

A. -- they provide no data to support that.

Q. Can you cite any literature that rejects this statement by Krusic and Roe in the 2005 report, which is Exhibit 7, and cited in your rebuttal report?

A. No.

Q. Can you cite any test data that you've done or that you have access to or that you're aware of that rejects this statement by Krusic and Roe at Exhibit 7?

A. No.

Q. Now -- see if I understand it correctly, Dr. Hopke.

You do not adopt Krusic's and Roe's findings about APFO decomposition as applied to your opinions in this case about Saint-Gobain's or

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CHEMFAB's processing activities; is that correct?

A. That's correct. They're irrelevant.

Q. Do you -- strike that.

Do you nevertheless adopt Krusic and Roe when it comes to their opinions about PFOA decomposition as applied to Saint-Gobain's processing activities?

A. Okay. I use them to show that the material decarboxylates. In order to decarboxylate, it has to lose the ammonia. In order to lose the ammonia, you then formed PFOA from the APFO. It will sublime before it decomposes in an open system, where you have good ventilation to dry the fabric. It will never get to these kinds of temperatures.

Q. What did Krusic and Roe conduct their test of APFO on?

A. I don't understand.

Q. Sure.

In this 2005 paper --

A. Yeah.

Q. -- what did Krusic and Roe say they found about APFO in quartz?

A. They say that it decomposed at 196 C.

Q. And what did PFOA -- I'm sorry.

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What did Krusic and Roe conduct their -- conduct their test on APFO -- well, strike that. Strike that.

Did Krusic and Roe also test PFOA in quartz?

A. Yes.

Q. Did you find Krusic and Roe's use of quartz for PFOA to be acceptable in terms of forming your opinions in this case about Saint-Gobain's and CHEMFAB's processing activities?

MS. JOSELSON: Objection.

You can answer.

A. Again, the big issue was whether, in the glass study in 2003, there were -- the glass itself was influencing the decomposition. So they moved to the quartz in order to have a chemically less reactive material in which their system was contained.

Again, in both cases, they do show that the system at high enough temperatures will decarboxylate. The PFOA will decarboxylate, but the point is that if APFO is decarboxylating, it has to lose the ammonium before that can occur.

Q. So let me see if I understand it, Dr. Hopke.

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Do you find the testing of PFOA in quartz to be reliable for your opinions in this case?

MS. JOSELSON: Objection. Asked and answered.

You can answer it again.

A. In that it does show that there is decomposition, decarboxylation of the PFOA, as one would expect at high enough temperatures.

Q. And do you find the testing of APFO in quartz to be reliable?

A. I don't know, because they provide no data.

Q. But as you sit here today, you don't have any criticism of the use of quartz to test whether or not PFOA or APFO decomposes --

A. No.

Q. -- is that fair?

A. That's fair. But it's a closed system, so it's a different problem.

Q. At page 2 of your rebuttal report, Dr. Hopke, which is Exhibit 4, at the top you say, "Decarboxylation will only occur in PFOA. It will not occur in crystalline APFO, where the ammonium ion is ionically bonded to the carboxy acid ion."

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Did I read that right?

A. Yes.

Q. Have you seen any paper in the literature that supports that opinion?

A. Not directly. I mean, again, this is a very standard chemical understanding of the system. In order to have a leaving group, okay, a reaction like this involves temperature increasing the vibrational frequency of the bond that's going to break.

If that carboxyl group is still attached to the ammonium ion, or it's bound within a crystal, then that will dampen that vibration to the point where there's no way that that's going to have enough energetics for that bond to break.

Q. Can you cite any paper in the literature that says decarboxylation will only occur in PFOA and not in crystalline APFO?

A. No.

Q. When did you first form --

MS. JOSELSON: Did you finish?

A. But, I mean, people wouldn't be looking for that because they know it couldn't happen.

Q. As you sit here today, can you identify

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anyone other than yourself who believes that only PFOA decarboxylation will occur and that it will not occur in crystalline APFO?

MS. JOSELSON: Objection.

A. I don't know of anybody, but I haven't looked. Again, there is no indication of Krusic trying to provide a mechanism.

Q. And if you flip back to Krusic 2004, Dr. Hopke --

A. '3 or '5? There is no '4.

MS. JOSELSON: I think it's Exhibit 6.

Q. It's Krusic 2004, which is Exhibit 6.

A. '3. Oh, no, you're right. Sorry.

Q. That's okay.

In fact, Krusic and Roe, don't they state that decarboxylation occurs in crystalline APFO?

A. Well, they say that they put a crystalline APFO in and they get decarboxylation. They don't really get into the details of the mechanism.

Q. Do they get into the details of the mechanism for PFOA?

A. No.

Q. Now, Dr. Hopke, under the "Experimental" section, which is at page 3801, do you see --

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A. Wrong one.

Q. It's still Exhibit 6. So you take your time and tell me when you're with me.

A. All right.

Q. So Exhibit 6 at page 3801 --

A. Yes.

Q. -- in the "Experimental" section.

Do you see that?

A. Uh-huh.

Q. Again, this is Krusic and Roe from 2004.

Do you see the clause that says, "The APFO was further recrystallized to yield the final sample"?

Do you see that?

A. Yes.

Q. And then do you see the actual conclusion of this paper, the first sentence on page 3803, "The experiments described above demonstrate that ammonium perfluorooctanoate decomposes rapidly at the elevated temperatures which are most often used to melt, process, or sinter fluoropolymers."

Did I read that correctly?

A. Yes, you did.

Q. And do you agree or disagree with that conclusion?

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A. Yes, I agree.

Q. And do you agree that the temperature range that they're referring to is stated in the first sentence of the article, 196 degrees to 234 degrees Celsius?

A. Yes.

Q. So when you say that -- strike that.

So you do believe that APFO can decarboxylize, correct?

A. I believe it can dissociate and decarboxylize -- decarboxylate.

Q. Did you ever read the Lines and Sutcliffe article from 1983?

A. I'm not sure.

Q. Just take a look at it. I'll have a few questions about it.

THE WITNESS: I'm going to cheat and get my reading glasses.

MR. FLEMING: Why don't we go off the record so Dr. Hopke can get whatever he needs.

MS. JOSELSON: His reading glasses.

THE VIDEOGRAPHER: The time is 10:52. We're off the record.

(The proceeding recessed at 10:51 a.m.)

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(The proceeding reconvened at 11:05 a.m.; appearances as before noted.)

(The following exhibits were marked for identification: Hopke EXH 8 and 9.)

THE VIDEOGRAPHER: The time is 11:05. We're back on the record. This marks the beginning of Disk Number 2.

PHILIP K. HOPKE, PhD, resumes;

CONTINUING EXAMINATION BY MR. FLEMING:

Q. We're back from the break. Are you ready to go, Dr. Hopke?

A. Yes.

Q. Okay. So I believe I gave you Exhibit 8.

Did you have an opportunity to review that, Dr. Hopke?

A. Quickly, but yeah.

Q. Okay. I'll just note for the record what it is again. It's Lines and Sutcliffe, and it's a 19 -- actually '84 paper in the "Journal of Fluorine Chemistry," right?

A. That's correct.

Q. And it has the name "Preparation And Properties of Some Salts of Perfluorooctanoic Acid," right?

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A. That's correct.

Q. And I noted that you said during the break you had an opportunity to review it quickly. Would you like more time to review that, Dr. Hopke?

A. I don't think so at this time. I think I can see what the relevant portions were likely to be.

Q. Okay. Well, any time you need more time, just let me know.

And I see that you're taking notes, Dr. Hopke. Can you tell me what you're writing on your paper there during the deposition?

A. Well, just getting the -- just getting the reference so I can get it later.

Q. Can we mark your notes? You can continue to use them, but we'll mark them as an exhibit to the deposition.

A. Okay.

Q. That will be out of sequence, but we'll mark it as -- why don't we mark Exhibit 9 now, and then we'll mark your notes as Exhibit 10.

MS. JOSELSON: What are we -- oh.

(The following exhibit was identified for the record: Hopke EXH 9.)

Q. So Exhibit 9, which I'll be asking you

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about, is a study in the "Journal of Fluorine Chemistry" by Hercules -- pretty good name -- 2016. I'll hand that to you, Dr. Hopke, but we're going to come to that next.

And then we'll mark your notes as Exhibit 10. So if you'll put a sticker on your notes, I would appreciate it.

(The following exhibit was marked for identification: Hopke EXH 10.)

MR. FLEMING: And, Emily, you need a copy of Hercules 2017. That's Exhibit 9. Hercules, Exhibit 9.

Q. So back to Exhibit 8.

Are you with me, Dr. Hopke?

A. Yeah.

Q. Okay. Great.

So do you agree with me, Dr. Hopke, that Table 2 of Exhibit 8, the Lines and Sutcliffe article, shows decarboxylation occurring in crystalline APFO?

A. No. It says "decomposition temperature." We don't know what it's necessarily decomposing into. All this is doing is a thermogravimetric analysis, where you're looking at the weight loss as a function of time and temperature. And so then the question is

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what -- what exactly is moving from the solid phase into the gas phase.

Q. Okay. So you agree with me that this article shows a decomposition of APFO, correct?

A. It shows that they're calling decomposition the loss of mass from the -- in the TGA.

Q. And isn't that what decomposition is?

A. It may also be sublimation.

Q. And this paper refers to it as decomposition, right?

A. They refer to it as decomposition.

Q. Okay. Have you reviewed this paper before today?

A. Not to my knowledge.

Q. Can you cite any paper that takes issue with Lines and Sutcliffe's conclusions about the decomposition of PFOA as set out in Table 2?

A. No.

MS. JOSELSON: Objection.

A. No. Because I hadn't analyzed it before now, so I haven't had any chance to look to see what other people have thought.

Q. And if you take a look at Figure 1, Dr. Hopke --

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A. Uh-huh.

Q. -- does it show a 100 percent loss of the APFO at 210 degrees Celsius?

A. Loss, yes, because there's no residual metal ion to leave a residue, like the other species in their series of studies.

Q. And then if you take a look at Exhibit 9, Dr. Hopke --

A. Okay.

Q. -- which is that Hercules article --

A. Yes.

Q. -- from 2017.

I'll give you an opportunity to review it. I'm just going to ask if you're familiar with this paper, to start.

A. No, I am not.

Q. Do you think you've reviewed this before your deposition?

A. No.

Q. So I have some questions about this article in the "Journal of Fluorine Chemistry" by Hercules, 2017, and you should take the opportunity to review it as much as you would like.

A. Yes, please.

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MS. JOSELSON: Do you want to go off the record?

MR. FLEMING: It's up to you. It doesn't matter to me. We can stay on the record.

MS. JOSELSON: I'm going to open the door while he does that, to cool off the air.

MR. FLEMING: Sure.

A. Okay. And this is a pretty complex paper with a lot of material in the supporting information that I don't have immediate access to.

So, I mean, we can -- we can explore it, but I'm not sure how far we can go without having time to really dig into all of the relevant material.

Q. And what information is missing that you think you need to dig into this?

A. Well, there's the video. There's the thermal -- there's the TGA graphs in the supplemental material.

I mean, again, what's the -- what do you see as the relevance of this?

Q. I'll ask you some questions.

A. Okay. Then let's see where we go --

Q. Sure.

A. -- but I'm going to have to be very

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cautious about how far I can go without, you know, much of a -- I mean this is a much simpler paper than this one is.

Q. Well, why don't we see what you think of the questions and we'll -- we'll work through it.

But what other information? You said videos and graphs? What were you missing from this paper?

A. All the supplemental material.

Q. Okay.

A. Again, the advantage of modern technology is that you can put much more details. It doesn't go into the print material; it goes into a supplemental file that is downloadable --

Q. Uh-huh.

A. -- including videos and other kinds of graphical material.

So you can put a great deal of additional information that -- that is supportive and still keep the print issue relatively short.

Q. I didn't see any of the supplemental materials for any of the other papers that you cited in your report.

Have you produced any supplemental

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materials related to those reports?

A. No, they didn't have any supplemental materials.

Q. Did you request any of the supplemental materials from the authors for this report?

A. No, no, no. Those all come with -- when you publish the paper, you submit both the paper and the supplemental materials.

I've had a paper where I had 90-some-odd pages of supplemental materials, enormous numbers of graphs, so people can see all of the details. But the publisher is not going to want to use its page budget for that material.

Q. All right. Just on all the other papers that you've relied on, have you reviewed any supplemental materials by the authors for any of them?

A. No.

Q. Okay.

A. No. If there had been supplemental materials, I would have included them in the materials I brought.

Q. Did you contact any of those authors to see if they had any supplemental materials?

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A. No.

Q. So the questions I have really relate on this Hercules article at Exhibit 9, and we'll see what you think, Dr. Hopke.

But doesn't this article show that decarboxylation occurs in the pentafluoropropionate salts that are listed in the article?

A. It seems to.

Q. And like magnesium, potassium, calcium, barium?

A. Right, at high enough temperatures.

Q. All of those are heavier than the ammonium in APFO, aren't they?

A. Lithium wouldn't be.

Q. Okay. I didn't -- I didn't mention lithium, but let's go through it.

Magnesium is heavier than the ammonium in APFO, right?

A. Yes.

Q. Potassium is heavier than the ammonium in APFO, right?

A. Yes, and sodium and calcium.

Q. Calcium is heavier than the ammonium in APFO, right?

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A. Yes.

Q. Barium is heavier than the ammonium in APFO, right?

A. Uh-huh.

Q. You have to answer audibly. Sorry.

A. Yes.

Q. "Ses-e-um," "See-see-um"?

A. "See-zee-um."

Q. Cesium is heavier than the ammonium in APFO, right?

A. Yes.

Q. And I was understanding you to say earlier that APFO can't decarboxylate because the ammonium ion is too heavy.

A. Again, if you get up to high enough temperatures, then you can start to dissociate the ionic bond, and now you can start to de -- but these are significantly higher temperatures. We're looking at 50 to -- at least, quick read, look like something like 50 to 100 degrees higher Celsius than -- than what we're talking about for the ammonium.

Q. So at Table 1, I see a reference to 196 degrees Celsius.

Do you see that, Dr. Hopke?

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A. For the potassium, yeah.

And, again, these are also esters, not -- we're not -- you know, we're not looking at quite the same chemical moiety as we would be in the perfluorooctanoic acid.

Q. But, again, these are all examples of materials that are decarboxylating that are heavier than the ammonium ion --

A. Right. But it's got -- it's got --

Q. -- in APFO?

You have to let me finish.

MS. JOSELSON: You have to let him finish.

A. Oh, I'm sorry.

Q. That's okay.

A. Yeah. But it's got an O-O bond in the middle, so it's not -- we're not talking about exactly the same chemistry.

And, again, without a lot more detailed understanding of what they're doing here, I really don't really feel comfortable commenting much further.

Q. So to form an expert opinion on that paper, you would need to review more of the materials related to it; is that your testimony?

A. Absolutely.

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Q. And you haven't done that?

A. No, because I'm just aware of it today.

Q. Did you do any kind of comprehensive or systematic search of the literature on the decarboxylation of other salts that may relate to materials that are heavier than the ammonium in APFO?

A. No, I did not.

MR. FLEMING: Let's mark another exhibit, Dr. Hopke. It's another scientific article.

Are we up to Exhibit 11?

MS. JOSELSON: Yep.

(The following exhibit was marked for identification: Hopke EXH 11.)

MS. JOSELSON: Thank you.

MR. FLEMING: You're welcome.

Q. So I've just handed you an exhibit, Dr. Hopke, and I'm just going to state what it is for the record. And then, similarly, you can take, you know, all the time that you would like to review it.

My first question, after I state what it is, is going to be: "Have you ever seen it before," just to preview that for you.

MR. FLEMING: But for the record, Exhibit 11 is an article called "The Pyrolyses of the

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Salts of Perfluoro Carbolics" -- I'm sorry -- "Perfluoro Carboxylic Acids," and it's by LaZerte, which is L-a-Z-E-R-T-E, from 1953.

Q. And, first, the only question I'll ask until you have an opportunity to look at it, Dr. Hopke: Have you reviewed this article before?

A. No, I haven't. It was clearly referred to in the previous article, but -- it said something about studies from the '50s, so this must be it.

Q. Have you ever seen any citation or reference to this LaZerte article?

A. No, I haven't.

Q. Are you aware that it's actually cited in the Krusic and Roe paper from 2004 that you're relying on for your opinions in this case?

A. Yeah, I saw it was cited there, but I didn't go back and look.

I mean papers that old are not necessarily as robust as more current literature.

Q. They can be, right?

A. They can be, right.

Q. And they may not be, right? You would have to review it to be able to form an opinion about how --

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A. Right.

Q. -- how robust or not it is, right?

A. And -- and, again --

Q. Is that right, Dr. Hopke?

A. Yes.

And, again, the fact that the material can decarboxylate is really irrelevant to my opinion, because my opinion is that the material never gets to high enough temperatures to where it would have the potential for decarboxylation. So basically all this discussion is irrelevant.

Okay.

Q. So, Dr. Hopke, in your rebuttal report at page 2, which is Exhibit 4, you had said that, quote, "Decarboxylation will only occur in PFOA. It will not occur in crystalline APFO where the ammonium ion is ionically bonded to the carboxy acid ion. The presence of the ammonium ion makes the 'leaving group' too heavy to allow the internal atomic motion needed to proceed to the breaking of the carbon-carbon bond."

A. Uh-huh.

Q. Do you still believe, Dr. Hopke, as you sit here today, that decarboxylation will not occur in APFO because the ammonium ion makes the leaving group

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too heavy?

A. Yes.

Q. And we've -- so let's take a look at this paper that is Exhibit 11 --

A. Uh-huh.

Q. -- on that subject.

Does Table 2 show that ammonium perfluorobutanoate salts can decarboxylate?

A. That they will decarboxylate.

Q. And are the salts listed in LaZerte -- in this LaZerte paper heavier than the ammonium ion -- I'm sorry. Strike that.

Are the salts listed in this LaZerte paper heavier than the ammonium in APFO?

A. Yes, except for lithium. But what you have here is a transfer of a fluorine to the metal, and that's why you get the residual metal fluoride as -- as the mechanism.

Again, they're not looking at the decar -- they're -- these are both synthesis papers, so they're not looking at the detailed mechanism. They're primarily looking at how to maximize the yield of a product.

Q. And do they conduct actual tests in this

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paper, or did they model it?

A. No, these are laboratory experiments.

Q. And do they show that ammonium perfluorobutanoate thoroughly decomposes to form 1H-Perfluoropropane, ammonia, and CO2?

A. That's what they report.

Q. Do you have any basis to dispute that that's what occurs?

A. No.

Q. Dr. Hopke, would you agree that a rate determining step is a chemical reaction or phase transition that is the slowest step in a series of reactions which determines the overall rate of reaction?

MS. JOSELSON: Objection.

A. Yes, within an overall mechanism.

Q. So if you have two reactions in a series, the slower one is the rate at which the overall reaction will occur; is that fair?

A. Yes, depending on what the relative values are. I mean they can be very close and not -- again, it depends on whether the second step is a rapid one or a...

Q. So, as an example, if one reaction occurs

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in an hour, one hour, and the next occurs in one second, the overall rate of reaction would be one hour; is that correct?

A. Roughly.

Q. It isn't averaged or affected by the faster rate, right?

A. No, but the overall rate would still take that second.

Q. So it would be an hour plus a second.

A. (The witness indicated nonverbally.)

Q. Is that right?

A. Yes.

Q. Dr. Hopke, am I correct that you came up with the idea of sublimation after you made your conclusions about emissions of PFOA in your class certification report and declaration?

MS. JOSELSON: Objection.

A. No. That was part of the overall thought and process in the beginning.

Q. Let's take a look at your prior transcript, together with a document called the "Acknowledgment of Deponent."

A. Uh-huh.

(The following exhibits were marked for

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identification: Hopke EXH 12 and 13.)

MR. FLEMING: So I've marked your prior transcript as Exhibit 12. This is the transcript of your deposition in this case dated April 3, 2018.

And then the Acknowledgment of Deponent -- which is you, Dr. Hopke, of course -- dated May 9, 2018, and that's Exhibit 13.

MS. JOSELSON: Thanks.

MR. FLEMING: You're welcome.

Q. Dr. Hopke, as I grab my copy, I was going to direct you to -- feel free to look at all of it that you'd like, but my questions will be related to the testimony at pages 230 and 232.

A. Well...

Q. So, Dr. Hopke, on Exhibit -- the acknowledgment there -- I'm sorry. Which exhibit is the acknowledgment? Is it a separate document?

A. This is 13.

Q. Yeah. If you could explain to me what your understanding is of Exhibit 13.

A. That's where I attempted to correct things where -- you know, there were some questions that I was not as clear as I needed to be in the original deposition.

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Q. So you tried to -- if I'm understanding you right, you reviewed your transcript previously --

A. Yes.

Q. -- is that fair?

A. Yes.

Q. And did you review it?

A. Yes.

Q. And you tried to identify things that you believe were not as clear as you would have liked; is that correct?

A. That's correct.

Q. Were any of the areas where you were not as clear as you would have liked in your prior testimony also errors in your prior testimony?

A. I don't think they were errors. It's just more a matter of -- of making things as clear and -- and precise as possible.

And, again, this is my first time ever doing this, and, you know, I'm not -- I'm not used to being under this kind of interaction.

Q. Okay. So, Dr. Hopke, at your deposition at page 230 --

A. Uh-huh.

Q. -- at line 2 --

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A. Uh-huh.

Q. -- I had asked you, quote: "Dr. Hopke, earlier in the deposition you mentioned the concept of sublimation, right?

"Do you recall that?"

And you answered: "Yes."

And then I asked: "That's not mentioned in either your merits or your class certification report, correct?"

And you said: "Correct. I found that information later."

So as you sit here today, is it still the case, is it still true, that you believe that you found your information on sublimation after you submitted your class certification report in this case and after you submitted your merits report in this case?

A. Okay. What I found afterwards was the details in the Barton and Zhu papers, which I had not included in the original certification report.

So my concept was sublimation. I avoided using the word because I was not sure that it would be commonly understood what I meant. I tried to describe it -- describe what I did in more conceptual terms.

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Now we're trying to provide greater clarity and -- and explication by getting into a much more detailed and -- and a description of what I believe happens.

Q. When did you first read the paper that gave you this idea for sublimation?

MS. JOSELSON: Objection to form.

You can answer.

A. There wasn't a paper that did that. It was my conceptualization of how this process was working.

Q. Do you see at page 231, Dr. Hopke, I asked you at your prior deposition --

A. Uh-huh.

Q. -- "When was it that you first read this paper that you seem to remember gave you this idea?"

And you answered: "About a week ago. I did another follow-up search on this."

Is that correct or incorrect?

MS. JOSELSON: Objection.

A. Again, what I found later was the Barton 2009 and the Zhu paper, which supported the original conceptual framework and gave it more specificity than I had in the prior. And, again, I was not as clear as

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I should have been here.

Q. And, Dr. Hopke, you didn't make any corrections in your acknowledgment relating -- relating to any of the testimony that we just discussed, right?

A. No. No, I did not.

Q. So, Dr. Hopke, if we could go back to page 2 of your rebuttal report.

In the middle there -- this is Exhibit 4. Are you with me? --

A. Yes.

Q. -- there's an equation, right?

A. Yes.

Q. What is this equation?

A. It's an equation that provides the vapor pressure as a function of temperature, taken from the Barton 2009 paper.

Q. And is this the vapor pressure for APFO or PFOA?

A. The vapor pressure of -- I'm not entirely certain. Let me look at the Barton paper so we don't make errors here.

It's APFO.

Q. And is the formula for the vapor pressure

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of APFO important to your opinions in this case?

A. Yes, because what they are really measuring in the Barton paper is, again, a way of estimating -- okay. So they're making vapor pressure measurements. So they're not actually measuring APFO; they're measuring the vapor pressure, the change in vapor pressure.

Q. So maybe walk me through just some of these codes here.

You see the "LN" and, in parentheses, "(P/PA)" on the left side of the equation?

A. Yeah. That's the natural log of the measured pressure to atmospheric pressure.

Q. And then on the fraction on the other side of the equation, the denominator has the letter "T."

A. That's temperature.

Q. "T."

And did you actually run calculations using this formula yourself?

A. Yes. That's how I got the 143 pascal at 150 C.

Am I right? I may have --

Q. And that's my question --

MS. JOSELSON: Did you want to look?

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THE WITNESS: No, that's okay.

Q. And that's my question, Dr. Hopke.

Can you explain to us how you get that figure that you just discussed of 100 degrees Celsius to be 4.5 pascals, based on this equation, for APFO?

MS. JOSELSON: Objection to form.

A. Huh?

Q. How do you get -- did I read it right? How do you get 4.5 pascals based on this equation at 100 degrees Celsius? Can you calculate it?

A. No. That was 100. It's estimated to be 4.5, and I think I took that from the Barton paper.

Q. So let me see if I get it again.

At 100 degrees Celsius under this formula, I'm understanding you to say that you get 4.5 pascals; is that correct?

A. That's my recollection.

Q. And that's what you wrote in your report, right?

A. Yes.

Q. So we could not get that figure based on this formula.

A. Okay.

MS. JOSELSON: I'm going to object to the

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form.

Q. Can you walk us through how you got it. Can you calculate it.

A. I would have to dig out my notes and spreadsheet to -- to be able to do that.

Q. Could you do it with a calculator?

A. I don't know. I mean I would be more comfortable getting back to the spreadsheet that I used to develop it.

Q. Have you produced the spreadsheet that you used to develop this to us?

A. No, I didn't.

Q. Is it a spreadsheet that you relied on to form your opinions in this case?

A. It was just to do the calculation. Calculations.

MR. FLEMING: Did we mark Barton 2009?

MS. JOSELSON: I don't think so.

THE WITNESS: It's part of the -- Exhibit 5.

MR. FLEMING: Okay. So let me grab my copy, and we'll figure out how we can mark it as an exhibit. All right.

THE WITNESS: It would be 5C.

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MR. FLEMING: Maybe.

MS. JOSELSON: It's noon. What are your thoughts about a break?

MR. FLEMING: I'm going try to continue the question that I've got here. But I would say, Emily, maybe 15 minutes, if that's okay for you.

MS. JOSELSON: Okay.

MR. FLEMING: If, Dr. Hopke, or -- you know, or Emily, you want to break for lunch sooner than that --

THE WITNESS: No, that's fine.

MR. FLEMING: -- that's certainly fine, but I would like to complete this question that I'm trying to get out.

THE WITNESS: Sure. Let's get through that.

MS. JOSELSON: Off the record or whatever, these questions are referring to his report at page 2? Is that what you said?

THE WITNESS: Yeah, here (indicating).

MS. JOSELSON: Okay. And here (indicating), right?

THE WITNESS: And there (indicating).

MS. JOSELSON: Yep. And here

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(indicating), right?

Dr. Hopke?

THE WITNESS: Yeah. This one is the one where it's 4.5.

MS. JOSELSON: All right.

Q. So you have Barton 2009?

A. Yeah.

MR. FLEMING: Are we on the record or off the record?

THE VIDEOGRAPHER: You're on.

MR. FLEMING: We're on. Okay.

A. So it's Equation 6.

Q. Okay. So, Dr. Hopke, coming back to this now, why don't we mark your copy of that as -- is it 5C now?

A. Exhibit 5C would be the next one.

Q. That would be logical.

So this was another document that was in that composite collection that you brought with you to the deposition, right?

A. Yes.

Q. And we're going to break out Barton 2009 as Exhibit 5C that you will have in front of you.

MR. FLEMING: I'll get you a copy.

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MS. JOSELSON: Thank you.

MR. FLEMING: You're welcome.

5C.

(The following exhibit was marked for identification: Hopke EXH 5C.)

Q. Okay, Dr. Hopke. So you see at page 754 of Barton 2009 --

A. Yeah.

Q. -- you cite an Equation 7, but there is no Equation 7, right?

A. Well, it must be a typo, because it's Equation 6, yep.

Q. Okay. But Equation 6 is not the same as your equation in your report, right? For APFO, right?

A. Okay.

Q. Am I right, Dr. Hopke?

A. Yes, that's correct.

Q. And, in fact, the numerator for the actual formula in Barton 2009 that you're relying on is minus 10936 over T, right? And you have 10695 over T, right?

A. That's correct.

Q. And then the added constant there, the correct one in Barton 2009 is 30.814, right?

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A. Yes.

Q. Not 37.292, right?

A. Correct.

Q. If you actually apply this formula, do you know how big of a difference it yields from the formula that you would get for APFO that's incorrectly cited in your report?

MS. JOSELSON: Objection to the form.

A. Not until I do the calculation.

Q. Would it surprise you if it's a factor of 1,000?

A. Yes.

Q. That's a pretty big difference, right?

A. I don't believe you calculated it correctly, then. Did you use the temperature in degrees Celsius or in degrees Kelvin?

Q. Celsius.

A. Kelvin. Thermodynamic equations are done in Kelvin. So that's divided by 373, not -- not 100.

Q. In your paper, you did 100 degrees Celsius, right?

A. Right. But when you plug it into the equation, people who know thermodynamics know that you report temperatures and calculate in Kelvin.

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Q. Okay. So you, as you sit here today, won't agree or necessarily agree or don't necessarily agree that the difference would be a factor of 1,000, right? Is that fair?

A. I would -- I cannot imagine it could be a factor of 1,000.

Q. Okay. As you sit here today, can you tell me how big of a difference it would be if you applied the correct formula that Barton 2009 cites for APFO as opposed to the incorrect one that you cited in your report submitted in this case?

MS. JOSELSON: Object to the form.

A. Not -- not quantitatively. It's not going to be as -- anywhere near that big.

Q. Okay. So not near as big as a thousandfold difference, but can you tell me in any way how big of a difference it would be?

A. Less than a factor of 10 would be my expectation. And less than that, likely.

Q. And I -- I take it, since you cited this formula, that you haven't considered whether or not a factor of 10 would be important to your opinions in this case, that differential, before this deposition?

A. Again, it's not going to make -- okay.

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This, I think -- I think what happened is I got this from the thesis, and it got changed when she put it into the -- into the paper.

Q. And you would rely on the one that's in the paper, right?

A. The paper would be the more reliable one, and I -- I --

Q. Is that the peer --

MS. JOSELSON: Let him finish.

MR. FLEMING: Sorry.

Q. Go ahead. Sorry.

A. And I -- I should have used the paper one.

Q. Okay. Because that's peer-reviewed, right?

A. Right.

Q. But you haven't calculated, again -- and then we can end this -- to make sure I have it right, you haven't calculated what the difference would be if you actually ran the correct formula for the vapor pressure of APFO or its effect on your opinions?

MS. JOSELSON: Object to the form.

Q. Is that correct?

A. I have not done that.

MR. FLEMING: Okay. Thank you for letting

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me finish that line of questions. I'm fine taking lunch now, if that's what everyone would like --

THE WITNESS: Yeah, that would seem like a good idea.

MR. FLEMING: -- instead of continuing for a bit. I don't think I would, you know, finish before lunch, so it's matter of, you know, being able to get out of here, you know, before then and take lunch later. So, basically, if everyone wants to eat lunch now, now is a good time.

THE WITNESS: Okay. Do you have a feeling for how much more?

MS. JOSELSON: What time would you like to come back?

THE VIDEOGRAPHER: The time is 12:01. We're off the record.

(The proceeding recessed at 12:01 p.m.)

(The proceeding reconvened at 1:04 p.m.; appearances as before noted.)

THE VIDEOGRAPHER: The time is 1:05. We're back on the record.

MR. FLEMING: So we're back on the record after our lunch break. It's about 1 o'clock. I guess we were off for about an hour.

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PHILIP K. HOPKE, PhD, resumes;

CONTINUING EXAMINATION BY MR. FLEMING:

Q. But, Dr. Hopke, I understand from what your attorney has told me during the break that you may have some further comment that you would like to make, based on whatever you were doing at lunch.

A. Yeah. We were able to get some help with calculating exponential functions, which my calculator on the phone won't do.

And so we discovered that, in fact, the vapor pressures that are reported, 4.5 pascals for 100 degrees C and 143 for 150 C were, in fact, correct. The typos are in the equation, which should, in fact, correspond to Equation 6.

So on that line before the equation, it should actually say, "Based on Equation 6 in Barton 2009."

The numerator of the first term on the right side of the equation should be 10936 and the additional term should be 30.814, as per Equation 6 in Barton. And then you'll get the 143 and the 45 when you calculate it using degrees Kelvin.

And you'll note in the Barton paper in the Figure 2, that the axis -- the x-axis is labeled as

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Kelvin.

Q. And did you calculate even in Kelvin that the order of magnitude, in fact, was over 1,000 with the --

A. It was more -- it went from -- yeah, it went from 4.5 to 5600.

Q. And that 150 degrees Celsius or 423.15 Kelvin, it went from 144 to 16,000 -- I'm sorry -- 165,591.

Does that sound right to you?

A. Right. But that's -- if I -- if I had plugged -- if I had actually plugged that into the spreadsheet, I would have recognized my mistake instantly.

Q. And I think at your prior deposition, there were occasions in which you referred to "we," and you jokingly said "the imperial 'we,'" meaning you.

A. Yes.

Q. Now when you're saying "we," who do you mean?

A. No, it's me.

Q. What's you?

A. It's all me.

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Q. Okay. So I take it, though, you -- on the phone, you were talking to somebody.

A. Yeah. I was talking to Gary Davis.

MS. JOSELSON: Huh-uh.

Q. And --

THE WITNESS: Huh?

Q. -- Gary Davis --

MS. JOSELSON: Kathy -- Kathy Dare.

THE WITNESS: Well, but Gary was the one that actually did the calculation. The second call -- we had a double.

MS. JOSELSON: Today you were talking --

MR. FLEMING: Let him answer.

MS. JOSELSON: -- to Kathy Dare.

MR. FLEMING: Let him answer, Emily.

A. I talked with Kathy, and when the call back, it came back from both Kathy and Gary.

Q. Okay. And did you say Gary Davis did the calculation?

A. Yeah.

Q. And he's the plaintiffs' attorney in this case, right?

A. Right. But you just plug it into Excel.

Q. And was it Gary Davis who typed in this

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incorrect formula into your report?

A. No.

Q. Who typed that incorrectly into your report?

A. I must have done it. I don't quite know how. Because I clearly had the right -- right formula in when I was doing the calculation, so I'm not sure how it happened.

Q. So just to make sure I have it right, Dr. Hopke, in your report, when you had the equation negative 10695 over T, that should be negative 10936 over T; is that correct?

A. That's correct.

Q. And when you have it in your report -- your rebuttal report again, of course, Exhibit 4 -- 37.292, that's incorrect, right?

A. That's incorrect.

Q. It should be, did you say, 30.814?

A. That's correct.

Q. Dr. Hopke, in your rebuttal report at page 3, there's a sentence -- you tell me when you're there.

Okay. There's a sentence at number 3, the last -- second-to-last sentence of that paragraph,

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begins "In this spreadsheet..."

A. Uh-huh.

Q. So it says, quote, "In this spreadsheet, the Algoflon D3312 dispersion did not identify the surfactant contained as APFO, but we know from other documents that it was."

It continues, "I did not use the spreadsheet I was questioned about in my deposition to calculate the omissions in my report, Exhibit 20," close quote.

A. Right.

Q. And I would like to ask you about that.

A. Sure.

Q. So first, Dr. Hopke, when you say "we know from other documents that it was," who is the "we" there?

A. This is the collective team that has accumulated material for this.

Q. Who was on the team?

A. Mr. Davis, Ms. Joselson, Gary Yoder, etcetera, etcetera.

So I'm not sure who precisely has, you know, arranged to get this material from Saint-Gobain, but, you know, I -- I'm obviously not the one who

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collected the original material, but -- so, in that case, it really is part of the overall team.

Q. And what other documents is the team referring to in the sentence here that we just read?

A. Okay.

MS. JOSELSON: Object to the form.

But you can answer.

A. Okay. Two things: One, if you look at the "Components" tab of Exhibit 20, which I brought along --

Q. Thank you, sir.

Was that within that composite Exhibit 5, what you have in your hand there?

A. Yes. Yep.

MR. FLEMING: Okay. So why don't we, if I may -- and I appreciate you giving it to me or identifying it for me. Can we make that 5D, I think we're up to.

(The following exhibit was marked for identification: Hopke EXH 5D.)

Q. So you have a copy already, or is this your only copy, this 5D?

A. That's my only copy.

Q. Okay. Well, I certainly want you to have

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the ability to have that in front of you. I think I may have a copy, so let me see if I can match it up.

A. The key is having the right tab. And it's a very wide spreadsheet, so it's one specific portion of it.

Q. Okay. So, Dr. Hopke, I'm going to hand you what was marked as Exhibit 20 at your prior deposition. Okay?

A. Uh-huh.

Q. And we're going to mark that as Exhibit 14 as well to this deposition. So I'll put a sticker on there.

A. Okay.

Q. So it's got two exhibit numbers.

(The following exhibit was marked for identification: Hopke EXH 14.)

MR. FLEMING: All right. And, Emily, here's a copy of the document.

MS. JOSELSON: Thank you.

Q. So the spreadsheet that was included in Exhibit 20 last time, right, did not include the page that you're identifying now --

A. Yes, I did.

Q. -- as Exhibit 5D?

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A. Absolutely, it does. There are multiple tabs, as you can see at the bottom.

Q. Okay. Sorry. I don't mean to interrupt you. But I think I understand what you're saying, but let me see if I can ask the question better --

A. Okay.

Q. -- and see if -- see if I do.

So the physical hard copy, Exhibit 20, that we used at your prior deposition did not include this page, which is 5D, that you've brought with you today, right?

A. That's correct.

Q. But if I'm understanding you correctly, it's your testimony that this spreadsheet, when it's viewed on a computer, has other tabs?

A. Right.

Q. And by accessing at least one of those other tabs, you can generate this 5D.

Do I have that right?

A. That's correct.

Q. Okay.

A. If you look at the bottom there, you'll see the other tabs marked out.

Q. Okay. So when you say that you did not

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use this spreadsheet that is Exhibit 20, did you consider any of the information that was in Exhibit 20 in forming your opinions in this case?

A. Not for the rebuttal report.

Q. Did you consider -- did you consider --

A. Again, we went over this in the deposition, and you -- we recognized that that spreadsheet, which was for -- excuse me -- the Merrimack -- the Exhibit 20 spreadsheet, which was for the Merrimack potential emissions from all 32 potential lines really could not include any and could not be directly applied to Bennington, where there could be only 13 lines.

Q. And do you still agree that that is the case; it could not be applied to the 13 lines?

A. Not for the total. One could look at any of the subtotals that were likely there.

However, we had Exhibit 19, which represented the emissions from the -- again, a Saint-Gobain-generated spreadsheet from 2001 that looked at the Bennington plant and listed out surfactants. And that's -- that's the spreadsheet we used to get the total of the 6,952 pounds of potential -- of emissions.

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Q. So let me see if I understand.

I'll ask you, Dr. Hopke, did you utilize the information that is contained in Hopke Exhibit 20 in the hard copy, the three pages double-sided, in forming your opinions in your rebuttal report?

MS. JOSELSON: Object to the form.

A. No.

Q. Did you utilize -- the three pages that are in Exhibit 20, did you consider them in any way, in forming the opinions in your class certification report in this case?

A. I don't think so. I think that came later. It certainly was something that we had looked at with regard to the deposition, but I don't think we looked at it for the certification report.

Q. Okay. So if I'm understanding you right, you think you may have reviewed Exhibit 20 in advance of the deposition, but after you put it in your report; is that correct?

MS. JOSELSON: Object to the form.

A. I think so.

Q. Okay. And when you refer to "we" there, who were you referring to?

A. Me. I'm sorry. I keep doing that.

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Q. That's okay. I'll just try to get clarity from you.

A. I understand.

Q. So then on Exhibit 5D, like Doug, to your current deposition, there -- and you've handed me a copy of it -- can you just explain to us what you're relying on this for.

A. Right. Okay. Again, it's listing out the ingredients in the surfactant mixtures.

And if you come over to the column that is listed as "Algo D3312X," the only component that they list as being in that material is ammonium perfluorooctanoate.

Q. And can you explain to us if there's any quantification of how much APFO is in there?

A. That spreadsheet says there's .330 percent.

Q. .330 percent, correct?

A. That's correct.

Q. Do you know the other constituents of it?

A. No.

Q. Do you have any information on how it was utilized, what processes?

A. Well, again, this was hypothetical for --

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for Merrimack. So, no, I'm not certain of that.

The other thing we know about 3312 is the deposition of Peter Knapp, who also said that 3312 contained APFO.

Q. Did you review anyone else's -- well, strike that.

Did you review Peter Knapp's deposition --

A. Yes, I did.

Q. -- transcript?

A. Yes.

Q. When did you review that?

A. I first reviewed it last fall, I reviewed it again prior to the deposition, and then I reviewed it again a couple of weeks ago.

Q. Did you review any other depositions in this case?

A. Not for the rebuttal report.

Q. So let me ask you, if I could -- if this makes sense to you -- since your last deposition, it sounds like you re-reviewed the Peter Knapp deposition; is that correct?

A. That's correct.

Q. Did you review any other transcripts since your last deposition?

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A. No, I have not.

Q. Okay. And do you have any information on how this Algoflon -- strike that.

Do you have any information on whether or not Algoflon 3312 -- sorry. I'll hand it to you.

A. Yeah. 3312X, yeah.

Q. So let me ask it again. I'm sorry, Dr. Hopke.

A. Sure.

Q. Do you have any information on whether Algoflon D3312X was used in Bennington or North Bennington?

A. Right. And that comes from the Exhibit 19, which lists the materials that were used, and that includes Algoflon D3312.

(The following exhibit was marked at a previous deposition: Hopke EXH 19.)

Q. And am I right, Dr. Hopke, that the Exhibit 19 from your prior deposition you're referring to is called "Actual Raw Material Use, Saint-Gobain, Merrimack, New Hampshire"?

A. That's --

Q. Is that correct?

A. That's correct. Although the sheet I have

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says "Table 7, Actual Raw Material Used, Saint-Gobain, Bennington."

Q. Okay. I did not see that. I see that now. Thank you, Dr. Hopke.

A. So to the best of my knowledge, this is -- this is Saint-Gobain's understanding of the materials they were using.

Q. And what do you base that on, that this is --

A. This came from Saint-Gobain, so...

Q. It came from Saint-Gobain, what? Table 7?

A. Yeah.

Q. And are you basing your view that this was used in Bennington, Vermont, on anything other than this document?

A. No. Well, yes. I mean, again, we have -- Mr. Knapp's deposition said that this material was being used.

Q. Okay. And I note, Dr. Hopke, that this Table 7 refers to D3312 Algoflon, right?

A. Yes.

Q. And the document you showed me before referred to D3312X Algoflon, right?

A. Yes.

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Q. Are they the same thing?

A. I'm not sure.

Q. What have you done to assess whether or not they are the same thing, if anything?

A. I have tried looking on the internet, but there's not a lot of detail available.

Q. Other than you ran Google searches or something?

A. Yes.

Q. Other than surfing the internet to see if there's a difference between D3312 Algoflon and D3312X Algoflon, have you done anything else?

A. No.

Q. Do you have any information, if it was used in Bennington, Vermont, in what processes it was used in Bennington, Vermont, either D3312 Algoflon or D3312X Algoflon?

MS. JOSELSON: Object to the form.

A. Okay. The only thing I can tell is that it was used in relatively large amounts, according to the spreadsheet.

Q. Do you know what, if any, processes or products it was used with?

A. No, I do not.

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Q. Dr. Hopke, at -- I believe it's your Exhibit 7. It's that Krusic 2005 paper.

A. Uh-huh.

Q. Do you have it in front of you?

A. I can bring it back up.

Q. Do you remember on page 1514, it had the statement by Krusic about the decomposition of APFO in quartz?

Do you remember that, on the right column?

A. Yes.

Q. And I think I was understanding you to say that you didn't know if that data was reliable -- I'm sorry. Strike that.

Do you believe that that statement is reliable?

A. I don't know, because the corresponding data is not provided in the paper.

Q. And, Dr. Hopke, if you look just in -- in the left column that's in the right column, beginning with the paragraph -- with the word "Previously" --

A. Uh-huh.

Q. -- doesn't it run through the data?

A. No. That's the sodium borosilicate glass. That's the 2004 paper that we looked at before, and we

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questioned that because of the presence of the transition metals in the -- in the glass.

Q. Do you see the last sentence of the paragraph that begins with the word "Previously"?

A. Uh-huh.

Q. Can you read out loud, "It was, therefore..." Can you read that sentence.

A. "It was, therefore, of interest to examine APFO thermolysis in flame-dried quartz ampoules in order to ascertain whether the APFO decompos" -- "decompos" -- "decomposition process was also sensitive to the type of reactive surface."

Q. And do you see the next paragraph, where it actually provides the data relating to this experiment?

A. Okay. Yes. But, again, in the other cases we were provided with nice, detailed data. We were not provided with nice, detailed data here. So it's -- it's less compelling because the -- one would have liked to have seen parallel kinds of information as they provided for in Figures 3 and 4.

Q. So let's discuss that, Dr. Hopke.

In the paragraph there in the left column, it tells you the temperature range that the APFO was

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studied at quartz, right? 196 to 234 degrees Celsius?

A. Yes.

Q. And does it tell you the amount of starting material that was used?

A. Yes. Well, yeah, it tells us...

Q. And does it identify the internal mass standard that was used?

A. Yes.

Q. Does it tell you the observed rate constants?

A. It -- it gives us the parameters of the rate constants, yeah.

Q. Does it tell you the associated activation parameters?

A. Yes.

Q. Does it tell you the amount of perfluorooctanamide that was observed?

A. Yes.

Q. Does it tell you the yield of that minor product?

A. Yes. It tells us it was found to decrease monotonically, moderate. It says modest amounts.

Q. Does it tell you the effective temperature on that yield?

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A. Yes.

Q. Does it tell you the half-life of APFO in quartz?

A. Yes.

Q. And was it 2 seconds at 307 degrees Celsius?

A. Yes.

Q. So what information is provided for PFOA decomposition in this paper that you find to be important that is not provided for APFO?

A. Again, it would be nice to see the time course that they show in Figure -- Figures 2 and -- or 3 and 4, rather.

Q. So I -- go ahead. Go ahead.

A. Again, just for completeness, it would have been much better to have shown all of the results. I mean with an NMR, they should be able to get fast enough response to be able to show, even over that short time, what the time course looked like.

Q. So it does show that APFO and quartz decomposed in -- for a half-life of 2 seconds at 307 degrees Celsius, right?

A. Right.

Q. And while, in your view, it may have been

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nice to provide more time course information, does that render this unreliable, in your view?

MS. JOSELSON: Object to the form.

A. No, it doesn't render it unreliable. It renders it somewhat incomplete.

Q. But you don't reject the findings of Krusic based on a lack of data relating to APFO and quartz when there's all this data provided that we just discussed, do you?

MS. JOSELSON: Objection.

A. At this high temperature, yes.

Q. The question might not have been formulated the right way, or I might not have understood your answer.

A. Okay. Well, again, they're only providing you one temperature. And so, you know, at this -- at this upper end of the range, it clearly -- it would appear to decompose in quartz relatively rapidly.

Q. So maybe I can tie it off and we can move on.

So do you reject Krusic's finding of the decomposition of APFO in quartz as stated in Krusic's 2005 paper?

MS. JOSELSON: Object to the form.

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A. I don't reject it, no.

Q. Dr. Hopke, do you agree that in order for APFO to be emitted as PFOA from the coating towers that Saint-Gobain or CHEMFAB utilized in Bennington and North Bennington during the manufacturing process, that the APFO in the solution would have to acidize into PFOA?

MS. JOSELSON: Object to the form.

A. It would have to be converted into PFOA, but my mech -- the mechanism I proposed in the rebuttal report provides the pathway to do so.

And we see PFOA in the plant in this recent Barr site report with the wipe tests where it's up on the I-beams, it's up in the stacks, so clearly PFOA is -- was being liberated into the plant and advected into the stacks.

Q. So, Dr. Hopke, do you -- do you agree or do you disagree that in order for APFO to be emitted as PFOA from the coating towers during the manufacturing process, the APFO in the solution would have to acidize into PFOA?

MS. JOSELSON: Objection.

A. No, not in solution.

Q. Were you ever of the view, Dr. Hopke, that

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the APFO in the solution would have to acidize into PFOA in order for it to be emitted from the coating tower?

A. I don't think so.

Q. Wasn't that the basis of your original report?

A. No. It wasn't stated sufficiently clearly that we were looking at the -- excuse me -- release as the material dried.

Q. Do you have your -- your deposition transcript from your original deposition?

A. It's here somewhere, yeah.

Q. It's Exhibit --

MS. JOSELSON: 12.

Q. -- 12.

A. It's a big, thick document. So there we go.

Q. So, Dr. Hopke, if you read the question and answer at page 73, lines 1 through 5 of your deposition dated April 3, 2018 --

A. Yeah, there was some possibility at pH 4 that it could go. But, again --

Q. I'm sorry, Dr. Hopke. I was asking if you could read aloud --

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A. Okay. Read aloud.

Q. -- lines 1 through 5 of page 73 of your deposition dated April 3, 2018.

A. Okay. "Yeah, because, again, we have information that at pH 4, about 6 percent of the PFO is really -- really is PFOA."

Q. So I think you may be on a different question and answer. That might be the source of the --

A. 71?

Q. I'm sorry. Page 73 --

A. 73. Oh, okay.

Q. -- at lines 1 through 5.

A. "Do you agree" -- okay.

Q. Can you read it aloud?

A. Yes, please. Sure.

Q. Thank you.

A. "Do you agree that in order for APFO to be emitted as PFOA from the cooling tower during the manufacturing process, the APFO in a solution would have to acidize the PFOA; is that correct?"

And I answered: "Yes."

But, again, I'm not good at depositions. This was my first one. And we're not really talking

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about release from solution, so it's -- you know, it's, again, a bit of a "gotcha" question.

Q. Dr. Hopke, when you submitted your acknowledgment where you tried to clarify things that you thought needed clarifications, did you identify this question and answer, this one that needed to be --

A. No. There were just too many, so I -- no, I did not make the change. I should have.

Q. As you sit here today, do you agree with what you said at your deposition dated April 23rd, that the APFO in solution would have to acidize into PFOA in order for it to be emitted from the towers?

A. If it's coming from the solution. Okay? That's not what we're hypothesizing. So, again, we're comparing apples and oranges here.

The whole purpose of the drawing is to get it into solids. Once it's in a solid, then it has the opportunity to rearrange and sublime.

Q. And none of that discussion about solids and the opportunity to sublime was in your original class certification report, correct?

MS. JOSELSON: Object to the form.

A. I didn't -- I didn't provide that level of

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detail.

Q. So to close it out, Dr. Hopke, is it true or is it not that in order for APFO to be emitted as PFOA from the coating tower during the manufacturing process, the APFO in the solution would have to acidize into PFOA?

MS. JOSELSON: Objection.

A. If it's coming from the solution, not if it's coming from the solid.

Q. And is it coming from the solution, in your opinion, in this case?

A. Probably not. But I think there's a very high probability that it's coming from the solid.

Q. Can you quantify that possibility or probability in any way for us that you've just described?

MS. JOSELSON: Objection.

A. I think it's much greater than 100 percent that we have -- that -- that what's happening, what supports the findings of the wipe tests is that as this material dries, moves into relatively higher temperatures of the order of 145, 150, it rearranges, sublimes, and leaves. So it never actually gets to high enough temperatures that it can decarboxylate.

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Q. And the wipe test that you're referring to, you had not reviewed at the time you submitted your rebuttal report, right?

A. They weren't available until August of this year.

Q. Okay. So accepting for argument's sake that they weren't available -- maybe it answers the question, but let me just see if I can ask it.

Did you review that wipe test that you're pointing to when you formed your opinions in your rebuttal report?

A. No. It came after the rebuttal report. So it's supporting my opinions now, but it was not available to be -- to be included into the rebuttal report.

Q. And then if we could go back to the exhibit -- is it Exhibit 5D that has the spreadsheet page that mentions Algoflon?

A. Uh-huh.

Q. So am I correct that you utilized this spreadsheet, Dr. Hopke, in calculating -- that's 5D -- potential emissions in this case?

A. No. All I used that for was to say that there was APFO in the D3312.

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What I did was to take the values provided in the other spreadsheet --

Q. Which is what?

A. -- Exhibit 19 spreadsheet, where it indicates that D3312 was used and that there was the emission of a quantity used of 2,506 pounds of wet weight.

Q. So you -- you used Exhibit 19 from your prior deposition to calculate your potential emissions in this case?

A. Right, along with the other -- other surfactants. So we took the sum of the materials used, and that's how we come up with the 6,952, if I remember correctly.

Q. And all of that information that you just mentioned is from your Exhibit 19 to your prior deposition?

A. Correct.

Q. Except you used the Exhibit 5 for the content related to Algoflon; is that right?

A. Right.

Q. 5D, I'm sorry. Right?

A. Right. To know that -- because the spreadsheet provided simply says "surfactant." And so

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trying to track down what that surfactant was, we had the Exhibit 20 sheet and we had Mr. Knapp's deposition to indicate that the surfactant was actually APFO.

Q. And did you make any assumptions in preparing your calculations related to this spreadsheet 19, Exhibit 19?

MS. JOSELSON: Object.

You can answer.

A. No. I mean, again, the only surfactant listed in Exhibit 20 is APFO, so that we then took the surfactant here and added it in as additional APFO.

Q. For --

A. I mean -- and it's -- and, again, just following the indication from -- from this spreadsheet.

Q. Which spreadsheet are you referring to now?

A. That's the Exhibit 19 spreadsheet.

Q. For what period of time did you assume that the quantities identified in Exhibit 19 were used?

A. I did not make any assumptions as to what the unit of time was. We know that this was from -- prepared in 2001. It's unclear what period of time it

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covers.

Q. Was it -- do you know if it was monthly data or weekly data or yearly data?

A. It's my understanding that this was annual use.

Q. And what do you base that understanding on?

A. Because they were -- they were -- my understanding is that they were providing this for permit purposes, and permit purposes would be your annual emissions.

Q. And did you determine whether the plant had the capacity to run all of these materials on an annual basis --

MS. JOSELSON: Object.

Q. -- in Bennington and North Bennington?

MS. JOSELSON: Sorry. Object.

A. No. Again, the -- this is saying "actual raw material use." "Actual" means that's what we used.

Q. So did you consider whether or not, if all the towers were operating in North Bennington --

A. Actual use.

MR. FLEMING: I'm sorry.

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MS. JOSELSON: You have to let him finish.

A. Sorry.

Q. So maybe it will be an answer to the -- to the question.

You're basing your view solely on that phrase that you just identified from this table; is that correct?

A. I have no other basis to make a decision. When -- when Saint-Gobain says, "This is what we used," I have no reason to doubt them.

Q. Did you test in any way whether or not the towers -- did you run any calculations to try to determine whether or not the capacity of Bennington or North Bennington could run all of these materials in a given year?

A. No, I did not.

Q. When you were using this spreadsheet that's Exhibit 19, did you assume that none of the emitted PFOA was destroyed by catalytic abatement equipment?

A. Yes.

Q. When using Exhibit 19 to calculate your emissions estimates, did you assume that all of the APFO that was contained within the incoming materials

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would convert to PFOA?

A. Yes.

Q. Did you assume that the APFO concentration was the highest concentration in the "not less than" range reflected on MSDSs?

A. I didn't make any such assumption. I simply took the numbers provided by Saint-Gobain.

Q. Do you know if the numbers on the spreadsheet at Exhibit 19 for the APFO concentrations are the highest concentrations in the "not less than" ranges reflected on the applicable MSDSs?

A. I do not know.

Q. Do you have an opinion, Dr. Hopke, as to whether or not, when an MSDS identifies a range "not less than" for a particular constituent, that means that the concentration is right at that highest maximum range?

MS. JOSELSON: Objection.

Q. Do you have an opinion on that?

A. I don't have an opinion one way or another. I haven't made any kind of measurements to determine distributions.

Q. So if an MSDS, by way of example, identified .33 percent for APFO content, as you sit

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here today, do you have any basis to know whether or not that might mean .1 percent in reality, .2 percent in reality, or .3 percent in reality, all are less than .33 percent?

MS. JOSELSON: Objection.

A. Nominally they could be in that lower range. The question is, would there be sufficient performance by the product in ensuring that there was not flocculation in the Teflon, and thereby reduce the quality of the product.

So one assumes that they had sufficient material in order to provide a functional product, and one -- it is highly likely that that concentration to provide that is going to be close to or at the MSDS limit.

Q. Do you have any data to support your view, Dr. Hopke, that it may be the case that in order to make the product functional, in order to make the product sufficient, it has to be at that high range of the MSDS?

Do you have any data to support that?

MS. JOSELSON: Objection.

A. No, I have no direct data. But we do know that on occasion they added additional surfactant in

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order to get the sufficient dispersion to get the product quality they required.

Q. So we know that on occasion surfactants were added, right?

A. Yes.

Q. Do you know what the content was to start with?

A. No, I don't.

Q. So you don't know if --

A. I don't have that level of detail.

Q. Right. So you don't know if it exceeded the range or brought it up closer to the highest part of the range, right?

A. I don't know.

Q. When using the spreadsheet that is Exhibit 19, did you assume that none of the generated PFOA emissions would be destroyed in the towers themselves?

A. Yes.

Q. Dr. Hopke, do you recall that on occasion the equipment within the towers had to be cleaned?

A. Yes.

Q. Do you recall that there was particulate on occasion in the towers or in the catalytic

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abatement equipment?

A. Yes.

Q. So it was capturing something, right?

A. Well, it's not clear there were -- there were particles in the abaters. There was certainly silicon deposition from, presumably, siloxanes that were being used. That would be gas phase, not particulate. You would not expect a lot of particulate matter to accumulate on the abaters.

The diffusion coefficients of the particles is much too low to permit significant deposition in the -- in the abaters. That's why they went to a filtration system in Merrimack as the test for PFOA abatement.

Q. Have you -- can you cite to me any tests or any documents that would show that there was not particulate matter within the towers?

A. No, I have no such data.

Q. And --

A. I mean there are certainly -- again, there are certainly some deposition, things like on the wall, because that's part of where the PFOA that comes up in the wipe test would come from. But that's going to be relatively small compared to the volume of

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material going out the stack.

Q. And I think you -- well, let me ask it this way: So there may be some particulate matter within -- there may have been some particulate matter within the coating towers; is that fair?

A. Some. Very limited.

Q. And can you cite any paper, any test data, any evidence as to the amount of particulate that would have been caught within the coating towers that you just described as very limited?

A. All we have is the wipe tests, and there is very limited data there.

Q. And, again, these are the wipe tests that you reviewed after you submitted your rebuttal report?

A. Yes.

Q. Since your last deposition, Dr. Hopke, have you reviewed any stack test data related to CHEMFAB or Saint-Gobain for PFOA or APFO?

A. No.

Q. Have you reviewed any, since your last deposition, industrywide data relating to stack tests for PFOA or APFO?

A. No.

Q. So I take it since your last deposition,

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you haven't gone back to form any new opinions or to evaluate -- well, strike that.

I'll ask it straightforwardly without introduction.

Since your last deposition, have you reviewed any stack testing data, you know, methodologies that were utilized for testing PFOA or APFO?

A. No.

Q. I take it since you haven't reviewed that, you're not offering an expert opinion on any actual stack test data for PFOA or APFO?

MS. JOSELSON: Objection.

Q. Is that fair?

A. Not beyond what we've already talked about.

Q. So I'm focused on stack -- if we've talked about your analysis of stack test data for PFOA or APFO, I would like you to point that out to me.

MS. JOSELSON: Objection.

A. No. You asked questions last time about stack tests in Merrimack and who's at fault, and I was at that point not very aware of that material, and so, you know -- and I haven't done anything further.

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I mean the point is, my -- the -- one of the major focuses of the critique of what I've been doing was the chemistry, and so I focused primarily on the chemistry here.

Q. Okay.

A. So the new material is -- the rebuttal material is focused on clarifying the -- explicating the mechanism, hopefully more -- more clearly than I have in the past.

Q. So in your prior deposition, you had testified that you had not reviewed the publicly available industrywide -- strike that.

I want to show you your testimony, and we can talk about it, just to make sure -- I really want to explore whether anything has changed since then that you've done to support your rebuttal report.

So if you'd take a look at page 108 of your prior deposition, at lines 14 through 17.

A. 108?

Q. Page 108.

A. Yes.

Q. I had asked: "Did you review the publicly available industrywide material balance report in coming to your opinions in this case?"

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And at that time you had said "No," right?

A. Yes.

Q. Now, let me ask you, did you review the industrywide material balance report in coming to your opinions that you expressed in your rebuttal report?

A. No.

Q. Did you review the stack test data for Saint-Gobain specifically in forming your views in your rebuttal report?

A. No.

Q. Did you form any view as to whether or not the data -- well, strike that.

Have you reviewed how the air sampling was done in either the industrywide stack testing report or the Saint-Gobain-specific stack testing report?

MS. JOSELSON: Object to the form.

A. No.

Q. I'm sorry?

A. No.

Q. Dr. Hoppe [sic] -- Hopke, I'm sorry -- did you review --

MR. FLEMING: Thank you. Do you want to change it now, the disk? It's up to you.

We might as well. We'll take a quick

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break.

MS. JOSELSON: Okay. It was getting to be an hour anyway.

MR. FLEMING: Okay. Very good.

THE VIDEOGRAPHER: The time is 1:57. We are now off the record. This marks the end of Disk Number 2.

(The proceeding recessed at 1:57 p.m.)

(The proceeding reconvened at 2:01 p.m.; appearances as before noted.)

THE VIDEOGRAPHER: The time is 2:02. We're back on the record.

PHILIP K. HOPKE, PhD, resumes;

CONTINUING EXAMINATION BY MR. FLEMING:

Q. We're back from a quick break, Dr. Hopke. Let me see if I could continue, if I may.

For your rebuttal report, did you consider the temperatures used by Saint-Gobain or CHEMFAB in their coating fabric processing?

A. Yes.

Q. And can you explain to me the temperatures that were used by them?

A. Okay. I mean they're actually fairly nicely laid out in Mr. Chinkin's report as well. You

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know, they have temperatures in -- for the drawing -- let's see if I have it.

MS. JOSELSON: While you're looking, I'll just object again; asked and answered in the last depo.

MR. FLEMING: Can you just read the question back, and I'll see if I formulated it correctly.

(The reporter read the requested material.)

Q. And then you were beginning to defer to Mr. Chinkin's report?

A. Yeah. It's a -- it's a good summary. I don't have -- I don't have anything else handy with me that goes back to the process documents.

Q. And your -- that report was submitted after your original deposition, right?

A. Yes.

Q. And it's referenced in your rebuttal report, right?

A. Yes.

Q. So let's talk about what -- the temperatures you considered in connection with your rebuttal opinions in this case, Dr. Hopke.

A. Right. So we have a drawing that runs

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from 93 to 149 degrees C, baking that runs from 288 to 343 degrees C, and fusing that goes from 316 to 371 C.

Now, the key, however, is that in moving from the drawing to the baking, you have to go through a thermal gradient. And so there will be a period of increase in temperature, which will support more rapid reorganization of the APFO and subsequent sublimation of the PFOA.

Q. And can you point me to any test data for APFO that would support -- well, strike that.

Can you cite to me any test data or any papers that talk about the -- did you say rearrangement of APFO?

A. That's what we're -- we've been talking about all day, is the transfer of the proton to the PFO and the de -- decompo- -- the separation into ammonia and PFOA.

And if we want to use Scheme 2 in Zhu as the analogy, that's fine, but the point is that -- that you are going to release ammonia and PFOA as -- as it heats, prior to any kind of decarboxylation.

Q. When you say "if we want to use Scheme 2," who are you referring to?

A. You, me, any of us.

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Q. So you're the person being deposed. I want to know what --

A. Okay.

Q. -- what your opinion is. You said that --

A. My opinion -- my opinion is that -- that we are going to get that kind of rearrangement and sublimation. As the temperature goes up, it will sublime. We're moving the air away from the product and into the tower, in order to make sure that the product is thoroughly dried and -- and not contaminated.

And so we're -- we have a good stream of flow away that's going to take the sublime material up into the tower and out into the environment.

Q. You rely on Scheme 1 from Zhu in your rebuttal report. Do you still rely on that, or do you no longer rely on that?

MS. JOSELSON: Objection.

A. It doesn't -- it's not terribly critical. Scheme 1 is going to -- is somewhat easier to understand. The fine details into Scheme 2 still provides the same basic mechanism, whereby we have to transfer the proton to the acid and release the ammonia.

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Q. So my question is more narrow. It's really not whether the differences between Scheme 1 and Scheme 2 are critical or not critical.

My question is: You rely on Scheme 1 in your report, correct?

Am I correct about that?

A. I provide Scheme 1 as a -- as a simple schematic to try and have people understand that there has to be the proton transfer and the separation of the ammonia and the PFOA.

Q. And you previously testified that you were relying on Scheme 1 for your opinions in this case.

And my question is: Is that still the case? Are you still relying on Scheme 1 that is cited in your rebuttal report in this case or not?

MS. JOSELSON: Objection. Asked and answered.

You can answer it again.

A. I'm relying on the basic chemistry that's going to rearrange that proton and give us the opportunity to separate the PFOA and the ammonia.

Now, I -- I could have put in the much more complicated diagram from Scheme 2 that would have -- again, trying to provide a clear path -- a

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clear description of the underlying basic chemistry without getting into the really super-details of...

Q. Wouldn't it have been clearer --

MS. JOSELSON: Let -- do you want to just let him finish?

MR. FLEMING: I think he was finished. He looked at me.

Q. Were you finished?

A. Yeah.

MR. FLEMING: Okay. So I was right. He finished.

Q. So, Dr. Hopke, wouldn't it have been clearer to cite the scheme that the authors of the paper proposed instead of the ones that they rejected?

MS. JOSELSON: Objection to form.

You can answer it again.

Q. Wouldn't that have been clearer?

A. To whom? I mean, to a chemist, yes.

I'm trying to project this to lawyers and average people, and so I'm not sure -- you know, again, I'm not sure that that additional level of complexity is going to make it clearer to the target audience.

Q. And you thought it was important to

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identify Zhu in your rebuttal report as a paper you're relying on, right?

A. Yeah, because it provides fairly clear evidence that this mechanism is likely -- is, you know, highly likely.

And by analogy and from the hypothesis provided by Barton et al., it seems the mechanism by which we would expect to get PFOA into -- into the gas phase.

Q. Can you identify anywhere in Zhu that says the mechanism that you adopted is highly likely to apply to APFO?

A. No.

Q. And, in fact, Zhu looked at ammonium chloride, right?

A. Yes.

Q. Now, if you'd turn to Barton 2009, which is your Exhibit 5C.

A. Yes.

Q. In fairness to yourself, Dr. Hopke, I say you should have a copy of it in front of you. But if you don't feel a need to do that, just let us know.

A. Too much paper.

Q. So I would like to direct you to page 754

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of Barton 2009, which is Exhibit 5C.

A. Uh-huh.

Q. And do you see where it says "Sublimation mechanism for APFO"?

A. Uh-huh.

Q. It says, quote, "The sublimation mechanism for ammonium salts was recently explored in Zhu et al., using NH4Cl as an example."

Did I read that right?

A. That's correct.

Q. And do you see where Barton 2009, the paper you are relying on, says, "The authors speculate a multi-stage process is involved"?

Do you see that?

A. Yes.

Q. And do you agree with Barton 2009 that the Zhu paper authors were speculating --

A. No.

Q. -- about a multi-stage -- you disagree with Barton 2009 on that?

A. I disagree. Scientists don't speculate; they hypothesize.

Q. Okay. So --

A. And they have good evidence -- they have

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good evidence for it. It fits the facts.

I mean, again, science is always questioning how things work. You develop evidence. You provide hypotheses. You test them to the best extent you can.

Zhu et al. have tested their hypothesis. It is highly plausible and highly likely that that is a pathway to the sublimation that they see.

Q. So -- and to be clear, Zhu et al. did not call it highly likely, right?

A. They suggested that this was the mechanism. They would not present it unless they thought it was the likely mechanism.

Q. Did Zhu et al. say that it was highly likely their mechanism was correct?

A. No. They did not include the adverb.

Q. So you are characterizing their conclusions in a way different from how the authors themselves characterized them, correct?

MS. JOSELSON: Objection.

A. I am -- from reading the paper and my knowledge of chemistry and etcetera, feel that they are -- you know, that this mechanism is highly plausible to me and will be applicable to the APFO

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case.

Q. In talking about the speculation comment I asked you to make, are you saying that scientists do not speculate, or they -- they're incapable of speculating?

A. Well, they're certainly capable of speculating, but a good scientist tries not to speculate. He tries to hypothesize so that you have, then, a testable hypothesis that you can then go on to the next step and see if you can gain additional knowledge that leads to a better understanding of the underlying phenomenon.

Q. So as a scientist, Dr. Hopke, what's the definition of a "hypothesis"? Is it proven?

A. No. It is -- it is our best estimation of what is likely to have to happen.

Q. Are all hypotheses, under your definition, likely?

A. No. Well, again, one generally tries to state likely hypotheses and then test them. Not all hypotheses are true.

Q. And if a hypothesis was likely, it would be important to say that it's likely, right, as a scientist?

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A. Well, again, you would not put a mechanism into a paper if you did not think it was likely.

Q. Do you have any --

A. And -- and the reviewers would tear it apart.

Q. Do you have any paper related to a scientific method or any other support for the view that a scientist in a paper cannot or should not develop a hypothesis that hasn't reached the level of likelihood?

MS. JOSELSON: Objection to form.

Q. Can you cite anything that's --

A. No, no, no, no, no. You're -- you're twisting the words.

Q. Okay. I don't mean to, so why don't you explain.

A. Okay. One can -- you know, one can take the data and then propose a mechanism. That, in effect, is a hypothesis.

Now, in this case, all of the data that they have collected reasonably fits that hypothesis. There's no way to statistically test it in the way some other kinds of hypotheses can be tested.

But the fact that -- that all of the data

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suggest -- support this -- this -- this mechanism then leads us to a reasonable conclusion that this is what is likely to be happening.

Q. Barton 2009 is a peer-reviewed paper, right?

A. Yes.

Q. So the peer reviewers didn't prevent Barton from stating that the Zhu authors were speculating, did they?

A. Yes, which was surprising.

Q. And if we can continue with the next sentence, it says, "The multi-stage sublimation model" -- this is in Barton 2009.

MS. JOSELSON: Can you give me a page reference?

MR. FLEMING: Sure. It's the next sentence that we were just reading from, so it's 754.

THE WITNESS: Uh-huh.

MR. FLEMING: It's the next sentence.

THE WITNESS: It's about ten lines up from the bottom in the left column.

MR. FLEMING: It's the third sentence underneath "Sublimation mechanism for APFO."

Q. "This multi-stage sublimation model can be

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applied to hypothesize the mechanism of sublimation for APFO."

Did I read that correctly?

A. Uh-huh.

Q. So it's a hypothesis, according to Barton, that the sublimation mechanism proposed by Zhu for ammonium chloride could apply to APFO; is that fair?

A. Yes.

Q. Now, do you know how long each of those phases that you mentioned before relating to Saint-Gobain's processes would occur in time?

A. No, I do not.

Q. And do you know if there was a variation based on a particular product that may have been the subject of coating?

A. No, I do not.

Q. Do you know how many different processes Saint-Gobain or CHEMFAB utilized to coat fabrics?

A. No, I don't know the specific number. I mean, obviously there were the 32 different processes that were outlined in Exhibit 20. So I assume that there are something in that number of possibilities.

Q. Since your -- well, strike that.

In connection with your rebuttal report,

PHILIP K. HOPKE, PhD - BY MR. FLEMING

Dr. Hopke, have you attempted to identify other potential sources of PFOA or APFO in the area of Bennington and North Bennington?

A. No. Dr. Siegel was taking care of that and has covered that extensively in his rebuttal report.

Q. So that's not your department, that's Dr. Siegel's department; is that fair?

A. Yeah.

Q. Colloquially.

A. Yes. Because he could use the distribution of well data to help clarify the potential for other sources.

Q. Dr. Hopke, at the outset of the deposition, you mentioned some teleconferences that I think you -- well, strike that.

Did you mention some teleconferences at the outset of the deposition?

A. Yes.

Q. Can you identify what those teleconferences were and with who, taking each in turn?

A. Okay. The main one was with -- with Dr. Shin, who is a consultant on the -- as I

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understand it, a consultant on the Hoosick Falls plants. And so I was just trying to find out from him whether he had any additional information on the -- the chemistry that -- that I was describing. He did not.

Q. And when did this telephone call take place?

A. Sometime in May.

Q. This would have been, then, after your deposition?

A. Yes.

Q. And before your rebuttal report was submitted.

A. Yes.

Q. And I think you described Dr. Shin as a "consultant." Consultant for whom, if you know?

A. I think it's the folks here who are involved in the plaintiffs' side of Hoosick Falls, but I'm not -- because when we were here in April, we were discussing with -- I don't remember the partner here --

MS. JOSELSON: If you know, you can answer his question.

THE WITNESS: Yeah.

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A. So I don't know -- I don't remember his name, but anyways, he was -- he was involved -- he was one the people involved in that case, mentioned Shin.

I obviously had seen the papers, and so we wanted to talk to him to see if he had any additional information that would be relevant to the Bennington site.

And so we arranged for a call, largely discussed his studies of the Washington Works, which were published in the 2011 paper, but really didn't get any additional insights into anything that would be applicable, specifically applicable to Bennington.

MR. FLEMING: And, Emily, I say this respectfully: I think the same rule about not interrupting the witness that applies to me should apply to you too. So I would ask you not to interrupt the witness as he's answering a question.

Q. Dr. Hopke, who else was on the phone with Dr. Shin?

A. Gary Yoder was certainly on. I don't remember whether Gary Davis was or not.

Q. Anyone else?

A. No, I don't think so.

Q. About how long did that phone call last?

PHILIP K. HOPKE, PhD - BY MR. FLEMING

A. 45 minutes to an hour. Certainly no less -- no more than an hour.

Q. And I just didn't understand your answer. So it's the same question. But forgive me; I didn't understand the answer.

Do you have any understanding as to who Dr. Shin is a consultant for?

MS. JOSELSON: Asked and answered.

You can answer it again.

A. Again, the -- whatever this -- Parseghian & Lang?

Q. Okay.

A. So that's -- that was my understanding, but I didn't really get into the details.

Q. A plaintiffs' attorneys' firm, right?

A. Right.

Q. Okay. And how did you come to get on the phone with Dr. Shin?

A. Well, we got his email and set up a time for a call that we could all make.

Q. Dr. Shin -- who got an email? You got an email?

A. We got his email address, and so we were able then to --

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Q. Whose idea was it to contact Dr. Shin?

A. I certainly raised that issue, yeah. I mean, again, he's somebody who's published as -- you know, I mean, his publications are primarily about the Washington Works, but then I heard he was also working on a coating plant. Then I wanted to see if he had any additional insights that would be helpful to us.

Q. Okay. So you raised the idea to contact Dr. Shin; is that right?

A. Yeah.

Q. Anything -- can you describe what was discussed with Dr. Shin in any more detail than you already have?

A. Well, again, we discussed things like the particle size distributions that we went over in some detail back in April.

And, you know, again, just what, if anything, he could add to the chemistry. And, you know, he's -- he's not that -- wasn't that versed in the chemistry, so it really didn't provide any additional information.

Q. So are you relying on anything that Dr. Shin told you on that phone call for your opinions in this case?

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A. No.

Q. Was there another teleconference that you had after your deposition and before you submitted your rebuttal report?

MS. JOSELSON: Objection.

A. We had a call with Gary Yoder to, once again, go over his questions with regard to the particle size distributions that he then put into his -- his rebuttal report.

Q. Are you relying on anything that Gary Yoder said on a phone call with you for your opinions in this case?

A. No.

Q. And who was on that call with -- with Gary Yoder?

A. Just Gary and I.

Q. And how long did that call last?

A. 45 minutes.

Q. And roughly when did that call occur?

A. July. Somewhere in July, so that he would have -- you know, because he was getting ready to get his report in by August 1.

Q. Were there any other phone calls that you had related to this case that occurred in between the

PHILIP K. HOPKE, PhD - BY MR. FLEMING

time you were deposed and the time you submitted your rebuttal report?

A. No.

Q. How about after you submitted your rebuttal report, did you have any similar types of teleconferences?

A. Yeah. We had a general group conference call in September that included Don Siegel and Ed Hinchey and Gary and -- Gary Yoder and I and Gary Davis.

Q. Was any of the discussion on that phone call -- strike that.

Are you basing any of your opinions on rebuttal in this case on anything that you were told in that phone call?

A. Well, the rebuttal report was in six weeks before that call occurred.

Q. Understood. Understood.

A. In terms of supporting my opinions now, not so much the phone call, but obviously I've read Dr. Siegel's report, and -- and particularly with respect to other sources.

And so, you know, that -- that was part of, you know, our separation of tasks in order to

PHILIP K. HOPKE, PhD - BY MR. FLEMING

adequately respond to the comments that we had gotten.

Q. Is there any more work that you intend to do in this case to support your opinions?

A. Only for what I'm asked to do.

Q. And as you sit here today, do you have any understanding as to whether or not you will be asked to do more work in this case?

A. Not that I'm aware of.

Q. So I can only go with what your intentions are as we sit here today. I mean, you're not sitting there thinking, "I know I'm going to be doing this extra work, but I'm not talking about it now."

Do you intend to do any more work, as far as you know, in this case to support your opinions?

A. Not that I -- not that I know of.

Q. Okay.

A. I mean, it depends on what the courts want, you know. If we have to come for hearings or things like that, then we'll do what we have to do.

Q. Okay. So I think -- there are a couple of documents that -- that you mentioned in the composite Exhibit 5 that I would like to talk to you about.

One would be the Shin paper and the other would be a document related to wipe samples that you

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discussed.

So I don't have a copy of the Shin paper, as you brought one copy for yourself, which is fine, Dr. Hopke.

So I'm just trying to think about the best way to do this. Maybe what I would suggest is we could go off the record, we could take a look at the Shin paper and the wipe sample document that you brought with you here today, and then we can try to talk to you about it.

A. Okay.

MR. FLEMING: If we're able make a copy here, we would do that, but I'm not sure that we can.

If we take a break, we'll figure it out.

THE WITNESS: Okay.

MR. FLEMING: All right.

THE VIDEOGRAPHER: The time is 2:31. We're off the record.

(The proceeding recessed at 2:31 p.m.)

(The proceeding reconvened at 2:48 p.m.; appearances as before noted.)

THE VIDEOGRAPHER: The time is 2:48. We're back on the record.

PHILIP K. HOPKE, PhD, resumes;

PHILIP K. HOPKE, PhD - BY MR. FLEMING

CONTINUING EXAMINATION BY MR. FLEMING:

Q. So we're back on the record, Dr. Hopke. Thank you.

I have two documents that you brought with you today that I'll read into the record and I'll hand back to you.

One is an excerpt of a document that was previously marked as Exhibit 5A, and it starts with Section 3.10 and it's entitled "Both Material Residue and Surface Wipe Sampling."

And then Exhibit 5E like Edward we've marked, and that's the Shin paper in "Environmental Science and Technology" --

A. Down at the bottom.

Q. -- in 2011.

So we only have one copy, and I'll hand you the copy back of 5A.

So, Dr. Hopke, are you relying on Exhibit 5A in any way for your opinions in this case?

A. For my current opinion, yes. It was not available in time for the rebuttal document. But this would suggest that there is PFOA found extensively within the plant.

The other thing that was of interest here

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was that there was also PFOS, and that had been previously raised as a question with regard to potential other sources, and that there was no PFOS used in the plant. Except that if there's PFOS in these wipe samples, then there had to have been at least some PO -- PFOS use in the plant.

Q. When did you -- how did you come to get this document that is Exhibit 5A?

A. Okay. We got an -- I got an email from Jamie Whitlock that he had gotten access to it through Vermont DEP -- or DEC; gave me -- gave us the download link for it. And because of the size of the document, it was impossible to email, and so I downloaded it.

And I did not read it in its -- you know, thoroughly; I skimmed it. But I found these -- there's parts of it that were seemingly highly relevant.

Q. When were you provided with the link from Mr. Whitlock, plaintiffs' attorney?

A. Somewhere between the time I came back -- somewhere between the 18th of August and the 31st of August. I would have to go back and find the email to be -- get the specific date.

Q. Either way, about 45 days ago or so?

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A. Something like that.

Q. And does this excerpt that is Exhibit 5A show data on any emissions of PFOA or PFOA into the environment?

A. No, it does not.

Q. Does this Exhibit 5A show any of the temperatures or operating conditions that were utilized when the materials identified in -- in those tests were obtained?

MS. JOSELSON: Objection.

A. No, it does not.

Q. Or at any other time.

A. Or at any other -- in the portions that I've read. I mean, I'm not sure whether it provides any greater description of processes.

Q. Is it fair to say that that's not a mass balance report or mass balance test?

A. No. These are experimental wipe tests, where they went out and swiped a specific area of -- of the walls or the I-beams or the inside of the stacks, leached the material from the wipe, and then made the analysis for the listed materials.

Q. So I think I understood your answer and what you meant by "no," but let me -- let me just ask

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it again, based on the way I asked the question.

So this Exhibit 5A, is that a mass balance test or mass balance report?

A. No, it is not.

Q. Does this test -- strike that.

Does this Exhibit 5A tell you where inside the plant PFOA was detected?

A. Yes.

Q. Where was it detected?

A. Again, there are schematics of -- and not having been to the plant, you know, I have some difficulty in terms of exactly what this -- where these things are relative to the actual operations.

But the indication is that, you know, they were looking at wall -- wall wipe samples located on the first-floor office area and the other -- other places. You know, "PFOA was detected in five samples collected from the front office in concentrations..." and etcetera, etcetera.

So they're looking at various places in the -- in the facility with, you know, varying concentrations of these compounds in terms of nanograms from a given wipe sample.

Q. Does -- was any PFOA found inside of the

PHILIP K. HOPKE, PhD - BY MR. FLEMING

towers?

A. There was one stack in the -- okay.

Okay. Now, it says, "WP03-STACK25.0 collected on 3/29/2018," and it says there were 19- -- 19,000 nanograms of PFOA found.

Q. Does it tell you anything about where within the stack it was found in terms of in the drying phase, in the baking phase, or in the sintering phase?

A. I was not able to find that level of detail.

Q. Do you know how many stacks were involved in this testing?

A. No. I mean, that's the only -- that's the only one that was specifically labeled "stack."

Q. Does 5A tell you how long that material, PFOA, was caught within the stack?

MS. JOSELSON: Object to the form.

A. No, it does not.

Q. Am I right? Is there PFOA caught in the stack, according to this 5A?

A. Well, there's -- there is PFOA on the wall in the stack, and so -- as I read it; and, therefore, it's there.

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Q. PFOA is sticky, isn't it?

A. Yeah, I would expect it to be, if it's in the gas phase. I mean, again, much of the PFOA would be expected to be associated with particulate matter.

Q. And the PFOA that was found within the stacks in this Exhibit 5A that you brought with you, was it in a solid form or a gas form?

A. Well, it wouldn't be in a gas form if it was stuck on the walls.

Q. So a solid form.

A. Well, or a monolayer. I mean, the question is what -- how thick does it need to be before you determine that it's -- I mean, it could be a viscous liquid.

Q. So what form -- I'm asking you, Dr. Hopke, do you have any understanding as to what form it was in, according to this Exhibit 5A that you brought with you, when it was -- when the PFOA was found within the stacks?

A. I don't know for sure. It's either got to be as a thin liquid film or as deposited particulate matter.

Q. Either way it shows that at least some PFOA is collected in the stacks; is that fair?

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A. Deposited in the stacks, yeah.

Q. Okay. Dr. Hopke, maybe we can turn to Exhibit 5E, which, again, is the Shin paper from 2011.

A. Uh-huh.

Q. The first question I have for you is: Are you relying on the Shin paper for any opinions of yours in this case?

A. Not directly. I mean, part of the purpose of the Shin paper was to look at what they used as particle size distributions to -- in other words, we have -- the information we have about the Washington Works, and about the only particle size distribution information we have, is from the Barton thesis, the other Barton paper -- which I think was 2007, but I'm not sure at the moment -- and the Shin paper.

And so I was working with Mr. Yoder to try and clarify the differences in those three sets of distributions so that he could make an informed choice in his rebuttal materials.

Q. Okay. See if I can ask a couple of follow-up questions. We'll wait for the siren to pass.

A. Sure.

Q. So Mr. Yoder, did you say, was interested

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in particle size distribution?

Is that fair?

A. Yes. This was one of the questions that you had raised with -- with him and with me, and so part of what we needed to do was to try and, again, clarify what information was available and, in our judgment -- particularly in his judgment -- what the most appropriate modeling parameters were in order to provide his rebuttal.

Q. Okay. So when did you review the Shin paper from 2011?

A. Oh. Again, back in May, prior to the teleconference with Dr. Shin, just so I'd be sure if I remembered what was in his work.

Q. Now, you can check me, because I'm asking, but am I right that Shin is not cited in your rebuttal report as a paper that you're relying on?

A. That's correct.

Q. And are you comfortable with that, or are you relying on Shin for any opinion in your rebuttal report on class certification or otherwise on class certification, or is it the case that Dr. Yoder is relying on what you told him about Shin?

A. Well, what we discussed about Shin.

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Again, I relied on Dr. -- on Mr. Yoder's AERMOD modeling and his expertise in applying the AERMOD to these kinds of problems.

What I was trying to do was to clarify why there were several different size distributions, and I think he's explained that fairly clearly in his rebuttal report.

Q. I don't mean this in an argumentative way, Dr. Hopke. I'm just trying to understand it.

If you're relying on Shin for your opinions on class certification -- and I don't know if you are, but if you are relying on Shin for your opinions on class certification, why didn't you cite them in either your original class certification report or your rebuttal report?

A. Because I wasn't relying on Shin; I was relying on Mr. Yoder's modeling.

Q. So is that another way of saying -- tell me if I've got it right or not -- that you're not relying on Shin 2011 for your opinions on class certification in this case?

A. That's correct.

Q. And that the Shin paper that's in front of you that's Exhibit 5E, it relates to a DuPont

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manufacturing plant, right?

A. That's correct.

Q. And that DuPont manufacturing plant did not coat fabrics, correct?

A. That's correct.

MR. FLEMING: So if I may, I would like to take a break and go off the record.

THE VIDEOGRAPHER: The time is 3:05. We're off the record.

(The proceeding recessed at 3:05 p.m.)

(The proceeding reconvened at 3:13 p.m.; appearances as before noted.)

THE VIDEOGRAPHER: The time is 3:13. We're back on the record.

PHILIP K. HOPKE, PhD, resumes;

CONTINUING EXAMINATION BY MR. FLEMING:

Q. Thank you, Dr. Hopke.

We're back from the break. I just have a handful of follow-up questions, I believe.

If you could take a look at Exhibit 5A. Again, that's the wipe test document that you excerpted and brought with you today, right?

A. Uh-huh.

Q. Are you able to quantify how much PFOA was

PHILIP K. HOPKE, PhD - BY MR. FLEMING

inside the stacks at the time that that test was conducted?

A. No.

Q. Do you have any reason to believe that the PFOA sample -- PFOA samples that were drawn and identified in the excerpt that you brought with you were the only amounts of PFOA that were caught within the stacks?

A. That would be unlikely.

Q. You mentioned PFOS before in connection with this Exhibit 5A, right?

A. Yes.

Q. Do you know where that PFOS came from that was identified in 5A? Do you know what source?

A. Which -- which -- no, I have no idea what source. All I can -- all I can do is scan this and see that there are some locations in which it was -- it was found at up to 140 nanograms per wipe. So...

Q. Did you see any locations where PFOA was found, but not PFOS?

A. I didn't look that carefully.

Q. Could you look now and see if, in fact, there were locations at PFOA was found, but not PFOS?

A. Yeah.

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Yes, there are such locations. Although --

Q. And do you know the source of the PFOA in those locations that was found, but without PFOS?

A. Not specifically. I haven't gone back and looked in that level of detail at -- at the schematics and understanding the building dynamics.

Q. And do you have any information or documentation showing that whatever the source may have been of the PFOS that's identified in this 5A was used in Bennington and North Bennington?

MS. JOSELSON: Object to the form.

A. I don't have any direct information that says that it was or wasn't. The point is that it's there.

Q. In Merrimack, right?

A. No, this is Bennington.

Q. Oh, I'm sorry. In Bennington.

A. Yeah. So it's clearly there in concentrations, you know, that are up a high of 140 nanograms. So...

Q. Can I take a look at the exhibit again. Thank you.

A. And in multiple locations.

PHILIP K. HOPKE, PhD - BY MR. FLEMING

Q. Okay, Dr. Hopke. So I think we can wrap up the deposition.

I mean, Dr. Hopke, do you believe that we've adequately covered the opinions that you intend to express related to class certification in this case?

MS. JOSELSON: Objection.

A. Yes, I believe so.

Q. Okay. To the extent -- well, strike that.

MR. FLEMING: Thank you very much, Dr. Hopke. I have no further questions.

THE WITNESS: Okay.

MS. JOSELSON: I'm done. I have no questions.

THE WITNESS: Okay. Thank you.

THE VIDEOGRAPHER: The time is 3:18. We're off the record. The deposition is complete.

(TIME: 3:18 p.m.)

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W I T N E S S

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* * *

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D O C U M E N T R E Q U E S T S

* * *

C E R T I F I E D Q U E S T I O N S

* * *

CERTIFICATE OF DEPONENT

I have read the foregoing transcript of my deposition and except for any corrections or changes noted on the errata sheet, I hereby subscribe to the transcript as an accurate record of the statements made by me.

_____

PHILIP K. HOPKE, Ph.D.

SUBSCRIBED AND SWORN before and to me this ____ day of _____, 20___.

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NOTARY PUBLIC

My Commission expires:

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NAME OF CASE: SULLIVAN VS. SAINT-GOBAIN PERFORMANCE

DATE OF DEPOSITION: OCTOBER 16, 2018

NAME OF DEPONENT: PHILIP K. HOPKE, Ph.D.

PAGE	LINE(S)	CHANGE	REASON

_____

PHILIP K. HOPKE, Ph.D.

SUBSCRIBED AND SWORN TO BEFORE ME

THIS___DAY OF _____, 20__.

_____ _____

(NOTARY PUBLIC) MY COMMISSION EXPIRES:

C E R T I F I C A T I O N

STATE OF NEW YORK:

COUNTY OF MONROE:

I, KIMBERLY A. BONSIGNORE, do hereby certify that the foregoing testimony was duly sworn to; that I reported in machine shorthand the foregoing pages of the above-styled cause, and that they were produced by computer-aided transcription (CAT) under my personal supervision and constitute a true and accurate record of the testimony in this proceeding;

I further certify that the witness requests to review the transcript;

I further certify that I am not an attorney or counsel of any parties, nor a relative or employee of any attorney or counsel connected with the action, nor financially interested in the action;

WITNESS my hand in the City of Rochester, County of Monroe, State of New York.

KIMBERLY A. BONSIGNORE
Freelance Court Reporter and
Notary Public No. 01B06032396
in and for Monroe County, New York

Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and

(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

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VERITEXT LEGAL SOLUTIONS
COMPANY CERTIFICATE AND DISCLOSURE STATEMENT

Veritext Legal Solutions represents that the foregoing transcript is a true, correct and complete transcript of the colloquies, questions and answers as submitted by the court reporter. Veritext Legal Solutions further represents that the attached exhibits, if any, are true, correct and complete documents as submitted by the court reporter and/or attorneys in relation to this deposition and that the documents were processed in accordance with our litigation support and production standards.

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